



Marine Mammal Protection

Act of 1972

April 1, 1973 through March 31, 1974

U.S. DEPARTMENT OF COMMERCE · National Oceanic and Atmospheric Administration · National Marine Fisheries Service



Prepared by

The National Marine Fisheries Service, National Oceanic and Atmospheric Administration
Washington, D.C. 20235 June, 1976

REPRINTED FROM FEDERAL REGISTER, VOL. 41, NO. 132 THURSDAY, JULY 22, 1976

NOTICES

...animal species and population... subject to the provisions of this Act. The report shall describe those actions taken and those measures believed necessary, including where appropriate, the issuance of permits pursuant to this title to assure the well-being of such marine mammals."

Section 3(12)(A) of the Act limits the responsibility of the Department of Commerce to those mammals which are members of the Order Cetacea (whales and porpoises) and members, other than walrus, of the Order Pinnipedia (seals and sea lions). Accordingly, there is published herewith the report of the Secretary of Commerce for the period April 1, 1975, to March 31, 1976, on the administration of the Act with regard to those mammals.

Issued at Washington, D.C.

Dated: June 21, 1976.

ELLIOT L. RICHARDSON,
Secretary of Commerce.

ADMINISTRATION OF THE MARINE MAMMAL
PROTECTION ACT OF 1972, APRIL 1, 1975,
THROUGH MARCH 31, 1976

REPORT OF THE SECRETARY OF COMMERCE

TABLE OF CONTENTS

Introduction.	
Authority for the report and administration of the act.	
Program activities.	
Summary of major activities.	
Public display and scientific research permits.	
Permit issuance policy.	
Regulations promulgated.	
General permits issued to the fishing industry.	
Waiver of the moratorium.	
Law enforcement.	
International programs.	
Part I.—National marine fisheries service actions taken pursuant to the provisions of the act.	
Public display and scientific research permits.	
Public hearings.	
Permit issuance policies.	
Status of general permits issued to the fishing industry.	
Requests for Certificate of Registration as tannery or as agent with respect to marine mammals taken by Alaskan Natives.	
Waiver of the moratorium.	
Legal actions brought against the Department of Commerce.	
Law enforcement.	
International program.	
International Whaling Commission (IWC).	
Food and Agriculture Organization (FAO).	
Inter-American Tropical Tuna Commission (IATTC).	
U.S.-U.S.S.R. marine mammal project.	
Environmental Protection Agreement.	
North Pacific Fur Seal Convention (NPFSC).	
International Commission for the Northwest Atlantic Fisheries (ICNAF).	
Convention on the Conservation of Antarctic Seals.	
International inquiries: Tuna-porpoise.	
United States-Mexico scientific meeting.	

DEPARTMENT OF COMMERCE

MARINE MAMMALS

Report of the Secretary of Commerce

Section 103(f) of the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361, 86 Stat. 1027 (1972)) states that "Within six months after the effective date of this Act (December 21, 1972) and every twelve months thereafter, the Secretary shall report to the public through publication in the FEDERAL REGISTER and to the Congress on the current status of all

IAC—Extended U.S. fisheries

Research program

Data for research and development

Geodynamics and development.

Biology and stock assessment.

Northern fur seal, pinniped, and cetacean research.

Northern fur seal program.

Pinnipeds of the U.S. Pacific coast.

Marine mammals of the Arctic Ocean and Bering Sea.

Cetaceans.

Funding.

Part II.—Current status of the stocks of marine mammals

Introduction.

Species list.

Status reports.

Contributors outside the Department of Commerce.

Laws and treaties governing the protection of marine mammals.

Part III.—Appendices.

Appendix A.—Tables.

Table I.—Common and scientific names of marine mammals.

Table II.—Synopsis of permit applications.

Table III.—Number of cetaceans requested under permit applications.

Table IV.—Number of pinnipeds requested under permit applications.

Table V.—Number of cetaceans authorized to be taken under permits.

Table VI.—Number of pinnipeds authorized to be taken under permits.

Appendix B.—Permit issuance policies.

1. Policy to establish a standardized procedure concerning the processing of applications for permits and the suspension of activities pursuant to existing permits.

2. Prohibitions contained in section 102(b) would be considered in connection with permits, waivers, and foreign programs.

Appendix C.—Incidental take regulations.

1. September 5, 1974.

2. September 20, 1974.

3. September 25, 1974.

4. January 3, 1975.

Appendix D.—Amendment to incidental take regulations (December 5, 1975).

Appendix E.—Methodology for comparing 1975 and 1976 porpoise mortality in the yellowfin tuna purse seining fishery.

Appendix F.—Notice of hearing to waive the moratorium to allow importation of fur sealskins from South Africa.

Appendix G.—Amendment to regulations governing the taking and importing of marine mammals.

Appendix H.—Funding table.

INTRODUCTION

Authority for the Report and Administration of the Act

This report to Congress is pursuant to requirements of Section 103(f) of the Marine Mammal Protection Act of 1972 (86 Stat. 1027; hereinafter called the "Act"). The Act, with certain exceptions, placed an immediate moratorium on the taking and importation of all marine mammals and marine mammal products. The responsibility of the Secretary of Commerce, under the Act, pertains to whales, porpoises, seals and sea lions; and the Secretary of the Interior is responsible for all other marine mammals, specifically sea otters, walrus, polar

bears, dugongs, and manatees. On November 30, 1972, the Secretary of Commerce delegated authority for the functions prescribed by the Act to the Administrator of the National Oceanic and Atmospheric Administration (NOAA). On February 9, 1973, the Administrator delegated this authority to the Director of the National Marine Fisheries Service (NMFS).

Program Activities

The principal NMFS activities related to administering the Act include: decisions and activities regarding the waiver of the moratorium, issuance of permits for scientific research and public display, enforcement of the provisions of the Act, promulgation of regulations to control the taking of marine mammals, research and surveys to determine the status of marine mammal population stocks, cooperation with the States, and international activities and agreements to conserve and manage marine mammals. A close working relationship has been fostered with the Marine Mammal Commission (established under Title II of the Act) and its authorized Committee of Scientific Advisors to facilitate interchange and consultation on substantive program matters.

In addition meetings were held periodically with interested national conservation groups, fishing industry representatives, zoo and aquarium operators, and individual researchers, to discuss the problems as well as proposed solutions involved in the implementation of the Act.

Two major issues during the past year have occupied much of the program's attention: the incidental take of porpoise by the yellowfin tuna purse seine fishery, and the request by the Fouke Company for a waiver of the moratorium on the importation of marine mammal products to allow the importation of sealskins from South Africa.

Porpoise mortality incidental to the U.S. tuna purse seine fishery remains one of the most significant problems NMFS continues to face in the administration of the Act.

The Marine Mammal Protection Act of 1972 and the legislative history, taken together, direct that the mortality and serious injury of marine mammals be reduced to insignificant levels approaching a zero mortality and serious injury rate, without shutting down or seriously curtailing the fishing industry. While there has been progress in reducing porpoise mortality through improved technology and fishing practices, the time required to attain the statutory goal to reduce porpoise mortality to insignificant levels approaching zero cannot be predicted.

The request by the Fouke Company for a waiver of the moratorium to allow importation of fur sealskins from South Africa was exceptionally difficult to deal with because the request involved several major precedent-setting policy considerations such as: management programs for commercial harvest, importation, humaneness, and the age at which marine mammals are taken. In addition

the waiver request raised foreign policy considerations.

Summary of Major Activities

PUBLIC DISPLAY AND SCIENTIFIC RESEARCH PERMITS

At the beginning of this report period (April 1, 1975), 24 permit applications were pending action. During the period of this report, 37 permit applications were submitted. Of these 61 applications, 42 have been approved, 1 denied, 1 inactivated due to insufficiency, 1 withdrawn, and 16 remain under consideration.

PERMIT ISSUANCE POLICY

The following policy determinations were made: (1) Prohibitions contained in Section 102(b) would be considered in connection with permit applications, waivers of the moratorium, and foreign programs with respect to taking marine mammals that are pregnant or nursing at the time of taking or are less than 8 months old, whichever occurs later; for the following purposes: (a) public display; (b) resource management; or (c) scientific research; and (2) a standardized procedure was established for processing applications for permits and the suspension of activities, pursuant to existing permits issued under the Act.

REGULATIONS PROMULGATED

Regulations covering administrative hearings in cases of proposed civil assessments for violations of the Act were amended to simplify procedures and to afford alleged violators a prompt hearing on the charges.

GENERAL PERMITS ISSUED TO COMMERCIAL FISHERIES

The Act allowed the taking of marine mammals incidental to commercial fishing without a permit during the first 24 months following the date of enactment of the Act. The Act provides that after October 20, 1974, no marine mammals may be taken in the course of commercial fishing operations unless the taking is done under permits. Under the regulations promulgated on September 5, 1974, as amended on December 5, 1975, five General Permits were reissued for the 1976 fishing season, for the following classes of gear: (a) encircling gear, yellowfin tuna purse seining; (b) encircling gear, seining other than yellowfin tuna; (c) stationary gear; (d) other gear; and (e) towed or dragged gear.

WAIVER OF THE MORATORIUM

The Fouke Company applied for a waiver of the moratorium to allow the importation of raw sealskins from South Africa and Southwest Africa for the purpose of processing. A public hearing was held, and the Director adopted the Administrative Law Judge's conclusion on several issues, deciding to waive the moratorium on skins from South Africa under certain specific conditions. Due to foreign policy considerations, the Director denied importation from Southwest Africa (Namibia). The Director's decision has been challenged in two civil

actions filed in U.S. District Court, Washington, D.C.

The State of Alaska applied in January 1973 to have the moratorium waived and State laws and regulations certified so as to return management of nine species of marine mammals to the State. A draft environmental impact statement and appropriate proposed regulation under which management could be returned to the State were issued on March 5, 1976. Hearings are expected to be held in July 1976.

LAW ENFORCEMENT

The first criminal indictments under the Act were returned by a Federal grand jury.

An investigation into a large-scale illegal commercial fur seal importation operation was concluded with the seizure of 500 fur sealskins from South America.

Contracts were renegotiated with Alaska, California, Washington, Oregon, and Florida that provide Federal funds to these States for enforcement of the provisions of the Act.

INTERNATIONAL PROGRAMS

At the International Whaling Commission (IWC) meeting held in June 1975, the United States indicated continued support for a 10-year moratorium on a commercial whaling. Such a moratorium was not adopted by the IWC but rather a "New Management Procedure" was established and subsequently all member nations of IWC, including Japan and the Soviet Union, have agreed to abide by all of the conservation measures, that include initially a moratorium on the harvest of any stock of whales which fall into the category of Protection Stocks.

The Marine Mammal Project of the U.S.-U.S.S.R. Environmental Protection Agreement, coordinated by NMFS, has promoted collaborative research programs conducted by scientists of both countries.

Delegations from U.S., U.S.S.R., Canada, and Japan met to renegotiate the Interim Convention on Conservation of North Pacific Fur Seals in December 1975. The Delegations agreed to recommend to their respective Government that they approve a draft protocol agreed upon at the December Conference. In view of the lack of agreement on optimum sustainable population the United States supported an amended 4-year extension of the Convention.

RESEARCH AND DEVELOPMENT

A promising gear development being tested in the tuna-porpoise research program is the Bold Contender system which incorporates a porpoise apronchute complex consisting of small-mesh webbing added to the net along the top of the required porpoise safety panel, and the "porpoise grabber," a specifically fitted pole used by men in a small life raft to remove porpoise from the net. In testing of the Bold Contender system the porpoise kill rate was substantially reduced when compared to the kill of a commercial fishing trip early in 1975 on the same vessel.

A joint cooperative program of research has been developed by the tuna industry, the Marine Mammal Commission, and NMFS, which will provide \$750,000 for an additional new research effort in FY 1976.

Based on the latest porpoise stock assessment data available, NMFS believes that the affected porpoise stocks are stable and are not considered to be threatened.

In FY 1976 the Marine Mammal Program received a program increase of 3 positions and \$600,000 to provide for additional research effort.

PART I.—NATIONAL FISHERIES SERVICE ACTIONS TAKEN PURSUANT TO THE PROVISIONS OF THE ACT

Public Display and Scientific Research Permits

Section 101(a)(1) of the Act and Section 216.31 of the regulations governing the taking and importing of marine mammals authorize the NMFS Director (by delegation) to issue permits to take and import marine mammals and marine mammal products for the purposes of scientific research and public display.

Although the Act declares a moratorium on the taking or importing of marine mammals and marine mammal products, the Act included exceptions that allow continuing research on marine mammals and taking of marine mammals for public display, providing that the health and well-being of the marine mammal species and populations involved as well as the marine ecosystem are not adversely affected. Permits may, however, be granted only after a review of the application by the Marine Mammal Commission and its Committee of Scientific Advisors on Marine Mammals.

One of the major considerations in issuing permits, which involve captive marine mammals for either scientific research or public display, is the quality of care provided. Following enactment of the Act, the National Marine Fisheries Service developed requirements for marine mammal care and maintenance, which have since been used as criteria for all permits involving captive marine mammals. These requirements appeared as Appendix C to the July 1973, Report of the Secretary of Commerce on Administration of the Marine Mammal Protection Act of 1972. Since enactment of the Act, the National Marine Fisheries Service has worked in close cooperation with the Marine Mammal Commission, the U.S. Fish and Wildlife Service (FWS) of the Department of Interior, and the Animal and Plant Health Inspection Service (APHIS) of the Department of Agriculture, as well as representatives of the display industry and concerned public groups, to develop more comprehensive standards for the care and maintenance of captive marine mammals. In October 1975, these efforts resulted in a set of standards and guidelines, prepared by the Marine Mammal Commission, The NMFS, FWS, and APHIS under the authority of the Animal Welfare Act of 1970 have been developing the means by which these standards and guidelines will

be implemented by the involved Federal agencies.

The factors to be used by the Director in determining whether to issue a scientific research permit include such considerations as whether the proposed taking or importing is consistent with the policies and purposes of the Act and whether the granting of the permit is required to further a bona fide, necessary, and/or desirable scientific purpose. Other factors in such decisions are the benefits anticipated to be derived from the scientific research contemplated and the effects of the proposed taking or importing on the population stocks and the marine ecosystem.

In determining whether to issue a public display permit, the Director considers, among other criteria, whether the proposed taking or importing will be consistent with the policies and purposes of the Act; and whether (1) a substantial public benefit will be gained from the display contemplated, taking into account the manner of the display and the anticipated audience on the one hand, and the effect of the proposed taking or importing on the population stocks of the marine mammals in question and the marine ecosystem on the other; and (2) the applicant's qualifications for the proper care and maintenance of the marine mammal, and the adequacy of his facilities.

Appendix A provides an overview of the scientific research and public display permit program, both for the period of this report and for the cumulative period since enactment of the Act. Table I of Appendix A provides a listing of the common and scientific names of the marine mammal species which may be involved in permit applications. Table II provides a summary of the applications received, the number of marine mammals requested, the various actions taken on applications, and the number of marine mammals authorized to be taken and/or imported. Tables III and IV provide analysis of the number of each species of marine mammals requested in permit applications. Tables V and VI provide a similar analysis of the marine mammals authorized to be taken and/or imported under scientific research and public display permits.

Scientific research permit applications have involved the following:

(1) Activities requiring the removal of living marine mammals from the ecosystem, which include: (a) Killing wild animals for the collection of biological specimen materials and measurement data; and (b) Holding animals in captivity for laboratory-oriented research.

(2) Activities requiring the removal of dead marine mammals from the ecosystem, which include:

(a) Collecting biological specimen materials and measurement data from dead marine mammals, not killed by permit holders (i.e., materials obtained from animals killed incidental to commercial fisheries, taken in native harvests, found beached or floating at sea); and (b) Importing biological specimen materials taken from previously killed animals.

Activities requiring the removal of marine mammals from the ecosystem, nor involving any significant probability of accidental death, which include: (a) Capturing, tagging, and/or marking, followed by release of the animals; (b) Marking and/or tagging by means of a remote technique, not involving capture and release; (c) Taking skin samples from cetaceans to determine sex; (d) Collecting measurement data and limited biological specimen material from living, restrained animals (i.e., blood samples, toenails, teeth), followed by release of the animals; and (e) Taking by actions technically considered as harassment, such as may occur in the course of aerial surveys, population counts, filming and sound recording activities, not involving direct contact with any marine mammals.

The research activities of greatest scope, in terms of the number of animals affected, involved animals which were not removed from the ecosystem.

During the period from April 1, 1975, through March 31, 1976, 37 permit applications have been received, in addition to 141 permit applications previously received (Table II). Of these 178 permit applications, 111 had been forwarded to the Marine Mammal Commission as of March 31, 1975, and 44 were forwarded to the Commission during the period of this report. As of March 31, 1976, the Commission had reviewed and submitted recommendations on 146 of the 155 applications referred to the Commission.

As of March 31, 1975, 117 permit applications had been resolved by means of permit issuance or denial, withdrawal of application, referral of applicants to the appropriate States involved in beached and stranded marine mammals, and through interagency agreements. During the period of this report, an additional 45 applications have been resolved in the following manner: 1 application has been withdrawn; 1 application has been inactivated due to insufficient response from the applicant to request for additional information necessary to certify an application complete; 1 application has been denied; and 42 applications have been approved. The 16 remaining applications of the 178 received to date are pending.

One of the 42 permits was issued to National Zoological Gardens of Sri Lanka, (Ceylon). This was the first permit issued to take marine mammals to be maintained in areas outside the jurisdiction of the United States. The permit was issued in accordance with NMFS policy published in the Federal Register March 12, 1975 (40 F.R. 11619) (Appendix B).

The Regulations provide that a permit may be modified, with sufficient prior notification to the permit holder, followed by publication of notice of the modification in the FEDERAL REGISTER. During the period of this Report, 22 permit modifications have been proposed and 18 made effective by publication in the FEDERAL REGISTER, in addition to 21 modifications previously proposed and made effective.

All permit holders are required, under permit conditions, to provide a number of reports, which may be of the following types:

(1) Reports on the taking of marine mammals; (2) Reports on the importing of marine mammals; (3) Reports on specific aspects of the husbandry of captive marine mammals, such as water quality; (4) Reports on marine mammal mortalities; (5) Monthly, quarterly, semiannual and/or annual reports on the health and condition of marine mammals held in captivity; (6) Reports on activities conducted under scientific research permits; (7) Preliminary reports on the progress of scientific research projects; and (8) Final reports concerning the results of scientific research projects.

During the period of this report, 136 reports have been submitted: 43 on the taking of marine mammals; 2 on imports; 58 on the health and condition of marine mammals held in captivity; 15 on mortality; 17 on research activities; and 1 on final research.

The Act and the Regulations provide for the charging of a reasonable fee to cover the administrative costs of issuing a permit. Public Display permit holders are assessed a fee of \$200, and scientific research permit holders are assessed a fee of \$25. Such fees are waived for Federal and State agencies. A total of \$5,200 has been collected during the period of the report from permit holders and deposited in miscellaneous receipts of the U.S. Treasury.

PUBLIC HEARINGS

The Act and NMFS Regulations provide for public hearings for several types of actions including: scientific research and public display permit applications, permit modification, regulations, and waiver applications. In addition, meetings are held periodically with interested national conservation groups, fishing industry representatives, public display facility operators, State and Federal agencies, and individuals to discuss the problems as well as proposed solutions involved in the implementation of the Act.

In determining whether to hold a public hearing on an application for public display or scientific research, it is the policy of the Director to consider such factors as 1) whether any interested person has requested a public hearing on such application during the time period set for public comment on the application, 2) the views of the Marine Mammal Commission on the desirability of holding a public hearing, 3) the nature of the application and the number of animals and species involved, 4) the extent to which a public hearing would facilitate the processing of the application, and 5) whether the application has aspects which require a major policy decision prior to making a determination on the permit application.

Three public hearings were held during the reporting period: two informal public hearings on proposed 1976 regu-

lations governing the issuance of permits for the incidental take of marine mammals in the course of commercial fishing operations; and a formal hearing, presided over by an Administrative Law Judge, dealt with the consideration of waiver of the moratorium on the importation of South African sealskins.

PERMIT ISSUANCE POLICY

Notices of all policy determinations and final actions taken thereon were published in the *FEDERAL REGISTER* (Appendix B).

On April 23, 1975, after receipt of public comments and consultation with the Marine Mammal Commission, the NMFS published in the *FEDERAL REGISTER* (40 F.R. 17845) a policy under which, with certain exceptions, the prohibitions contained in Section 102(b) would be considered in connection with the international taking of marine mammals on the high seas and in waters or on lands subject to the jurisdiction of the United States. This policy is used in considering, where appropriate, permit applications, applications for a waiver of the moratorium, and foreign programs with respect to taking marine mammals which are 1) pregnant at the time of taking, or 2) nursing at the time of taking, or less than 8 months old, whichever occurs later in the following cases:

1. Such taking is for the purpose of public display, will further the education of the public, and will not be detrimental to the health and well-being of animals taken into captivity; or

2. Such taking is determined by the Director, in consultation with the Marine Mammal Commission, to be a part of a resource management program which is consistent with the purposes and policies set forth in Section 2 of the Act; or

3. Such taking is for approved scientific purposes.

For purposes of this policy "nursing" means nursing which is obligatory for the physical health and survival of the nursing animal.

A second policy established a standardized procedure concerning the processing of application for permits and the suspension of activities pursuant to existing permits issued under the Marine Mammal Protection Act and/or the Endangered Species Act (Appendix B). The policy states that "No permit shall be issued under either Act to any person who is under investigation for or officially charged with a violation until the matter is resolved."

The provisions of this policy also apply to all permittees who have been issued permits under the Act where a permittee is under investigation for or has been formally charged criminally or administratively with an alleged violation of either Act, the regulations promulgated thereunder or permits issued pursuant to the Act and regulations. In such cases, action will be initiated to suspend, in accordance with applicable regulations, the permit of any person under investigation or officially charged with a violation. In addition, the policy applies to all per-

mittees or applicants who have been convicted of or administratively assessed a penalty for such violations or have disposed of charges by a civil compromise acceptable to the NMFS. If a person, who has been found guilty of a violation (either through administrative or criminal proceedings) or has disposed of a Notice of Violation in a manner acceptable to the National Marine Fisheries Service, should (i) apply for a permit; (ii) be working under a permit, issued by the National Marine Fisheries Service, or (iii) be included as a participant in activities authorized by a permit or activities set forth in a permit application, the National Marine Fisheries Service will consider each such case on its merits, taking into consideration the circumstances surrounding the violation and severity of the penalty imposed.

STATUS OF GENERAL PERMIT ISSUANCE TO THE FISHING INDUSTRY

The Act provided, in Section 101(a)(2), that during the 24-month period initially following the date of enactment of the Act, the taking of marine mammals incidental to the course of commercial fishing operations was permitted. Therefore after October 20, 1974, no marine mammals may be taken in the course of commercial fishing operations unless the taking is done under a General Permit and Certificate of Inclusion as specified in regulations. All five General Permits which were designed to reduce marine mammal mortality and serious injury were established by regulations promulgated on September 5, 1974. The five general permits were issued to allow marine mammals to be taken in the course of commercial fishing operations during the period from October 21, 1974, through December 31, 1975 (Appendix C): (a) encircling gear, yellowfin tuna purse seining; (b) encircling gear, seining other than yellowfin tuna; (c) stationary gear; (d) other gear; and (e) towed or dragged gear.

In January 1975, NMFS announced a goal of a 50-percent reduction in the number of porpoise killed per ton of tuna taken in association with porpoise in 1975, compared with 1974. This was a goal, and not a quota. In setting the kill rate of one porpoise per 2 tons of tuna as a goal, it was assumed that fishing conditions in 1975 would be comparable to those in 1974. Conditions were not comparable, and the goal was not achieved. The kill per ton rate increased from 1.1 in 1974 to 1.2 in 1975. The final estimate of porpoise mortality for 1975 was 134,200, an increase of 36,400 animals over 1974. The 37-percent increase in porpoise mortality was due to differences in fishing conditions such as: an increase in porpoise school size, species composition of the porpoise schools, and because a greater portion of the total yellowfin tuna catch was caught in association with porpoise in 1975, compared with 1974.

When the data were adjusted for comparable conditions of fishing, the rate of

porpoise killed per set apparently decreased between 1974 and 1975 by 22 percent, with an overall decrease of 44 percent between 1973 and 1975. The apparent improved U.S. fleet performance in 1975 was most likely due to the increased use of rescuers at the corkline to remove live porpoises by hand as required by regulations.

In the course of developing 1976 incidental take regulations, NMFS proposed several modifications to the 1975 regulations which were designed to further reduce the incidental mortality. These proposed modifications were published in the *FEDERAL REGISTER* on September 5, 1975. The modification included gear and fishing techniques which have been proven effective in reducing porpoise mortality as well as a 100-percent observer effort. Following public hearings on October 9 and 10, in Washington, D.C., and on October 24 and 25, 1975, in San Diego, California, Congressional hearings on October 21, 1975, and the National Environmental Policy Act requirements, NMFS promulgated the new regulations on December 6, 1975 (Appendix D).

All the proposed modifications announced in September 1975 were not adopted. Although the training of fishermen and gear inspection programs have been continued, the proposed 100-percent observer program and the immediate imposition of a quota were not adopted. NMFS had announced in the *FEDERAL REGISTER* that it was considering placing observers aboard all U.S. purse seine tuna vessels operating under a general permit. It was decided not to implement the 100-percent observer program after it was determined that the scientific data to be collected and the benefit to be gained from such a program could be achieved, to a large degree, at a substantial cost reduction by placing observers on a scientifically acceptable 10-percent sample trips by tuna vessels. The Marine Mammal Commission, the Agency designated by Congress in the Act to oversee marine mammal protection activities, stated that a 100-percent observer program was "not worth the expenditure of time, effort, and money."

The regulations for the 1976 fishing season included fishing gear and technique requirements that have been proven to be effective in reducing the causes of porpoise mortalities. They include the use of sections of small-mesh webbing to reduce entanglement, the closure of small openings to reduce entrapment, back-down procedures to release encircled porpoises, and hand-release procedures when necessary, among other things. The regulations also require that vessels take observers when selected.

Each year since 1971, U.S. tuna seiners have carried increasing numbers of NMFS field technicians to collect biological and mortality data. These observers are placed on vessels selected by a random drawing. Vessels are stratified into three vessel-category groups in order to obtain a representative sample of the total fleet performance. In 1975, 45 vessels carried observers, and, in 1976,

45 have been selected to carry observers. The field observers generally are biologists, hired and trained by NMFS and preferably have had some sea experience.

In addition to the observers, 20 NMFS gear technicians are planned to accompany U.S. purse seiners to record data concerning experimental net modifications and gear being voluntarily tested by the vessels.

To ensure continued progress toward reduced porpoise mortality, a quota would be established if the total mortality for 1976 were projected to exceed 70 percent of the 1975 mortality, based on a comparison of the 1975 and 1976 observer data through April 14. A decision as to whether a quota will be established in 1976 will be announced at a public meeting in late May 1976. The level of the quota if required will be established following the initial decision as to whether a quota is to be imposed.

There is no reason to believe that a quota on incidental taking, if established at the commencement of the fishing season, would have been any more effective than the action taken. A quota imposed at the beginning of the year could have undermined the observer-crew relationships, hindering cooperation with carrying out needed scientific research. There has been a marked increase, during the past several months, in the degree of cooperation and good faith by the fisherman and the tuna fishing industry. Since the immediate imposition of a quota might have tended to stifle this cooperative attitude, it was preferred to allow an interval in which to evaluate the industry's willingness and ability to produce significant results. This approach seems to have been borne out by the fact that preliminary, unedited data from the observer trips early in 1976, indicate a significant reduction in porpoise kill of up to 50 to 60 percent as compared to a similar time period in 1975. The reduction in mortality appears to result from fewer sets being made on porpoise due to the availability of "non-porpoise fish" as well as improved performance of the fleet (lower kill per set).

Requests for Certificate of Registration as Tannery or as Agent with Respect to Marine Mammals Taken by Alaskan Natives

Section 216.23 of the Regulations provides that marine mammals taken by an Indian, Aleut, or Eskimo resident of the coast of the North Pacific or Arctic Ocean, for the purpose of creating and selling authentic native articles of handicraft and clothing may be transferred to a registered tannery, either directly by the Indian, Aleut, or Eskimo or through a registered agent. Similarly, marine mammals taken by Alaska Natives for subsistence may be sent to a registered tannery for processing and subsequent return to an Alaska Native.

Any tannery or person who wishes to act as an agent within the jurisdiction of the United States may apply for registration as a tannery or an agent allowed to possess and process marine mammal products for Indians, Aleuts, or Eskimos.

Prior to April 1, 1975, six tanneries and five agents had been granted Certificates of Registration as Tannery or Agent in accordance with Section 216.23 of the Regulations. Two of these registered tanneries had surrendered their Certificates prior to April 1975. During the period of this report, one additional Certificate has been granted to a tannery, and four to agents.

Waiver of the Moratorium

Two waiver applications were under consideration: The Fouke Company application relating to the importation of Cape fur sealskins and the State of Alaska request for return of management authority for nine species of marine mammals (6 under NMFS jurisdiction and 3 under Fish and Wildlife Service jurisdiction).

The Fouke Company of Greenville, S.C., is the sole processor of fur sealskins in the United States and the largest fur sealskin processor in the world. The Company has processed fur sealskins almost continuously under contract with the United States Government for over a half century, and has imported raw sealskins from South Africa for 50 years. Its primary sources of raw product have been Northern fur sealskins from the Pribilof Islands, Alaska, and Cape fur sealskins from South Africa.

The Fouke Company, on March 17, 1975, applied for a waiver of the moratorium to allow the importation of 70,000 Cape fur sealskins from the 1975 harvest to be conducted in South Africa and Namibia. A similar waiver request, for the 1974 harvest, was denied by the Director due to a determination by two independent veterinarians that the harvest was conducted in an inhumane manner. Proposed regulations to govern the proposed waiver, information required by Section 103(d) of the Act, and a notice of hearing were published on July 7, 1975 (40 FR 28469) (Appendix F). In considering the 1975 waiver request NMFS contracted the same two veterinarians whose reports were the basis for the 1974 denial. They determined that sufficient improvement had taken place in the 1975 harvest to conclude that the harvest was conducted in a humane manner. A pre-hearing conference was held on September 8, 1975, and thereafter a public hearing was held on September 18 through 24, 1975. On December 16, 1975, the Administrative Law Judge issued a recommended decision based on the record that a waiver should be granted.

The Director adopted the recommended decision of the Administrative Law Judge with some modifications and waived the moratorium to permit the importation of up to 19,189 skins of Cape fur seals harvested within the Republic of South Africa and harvested by or under the auspices of the Republic of South Africa and under the following conditions: (1) no more than 70,000 Cape fur seals are harvested in any one annual harvest conducted by or under the auspices of the Republic of South Africa commencing with the 1975 harvest. This

level of harvest will be adjusted to reflect the results of an annual review which may indicate that a different harvest level is appropriate to allow the populations to remain within the range of optimum sustainable population. (2) The skins were taken from Cape fur seals which at the time of taking were not: (a) nursing; (b) pregnant; or (c) less than 8 months old. (3) The skins are from Cape fur seals not taken in a manner deemed inhumane by the Director. (4) Skins from Cape fur seals harvested subsequent to 1975 may be imported; provided, the Director upon annual review determines that conditions warrant continuation of the waiver. This review will include, among other things, an assessment of whether efforts have been made, in good faith, to: (a) develop a program which will provide additional information regarding age, sex, mortality rate, and fecundity rate of Cape fur seals; (b) expand the program of tagging, aerial photographs and other methods of collecting data, in order to provide an accurate and systematic monitoring of the Cape fur seal population; (c) develop a program which will provide additional information on the interrelationship of the Cape fur seal and its ecosystem; and (d) expand upon programs to ensure the continuation of acceptable standards of humane taking.

The State of Alaska has applied to the Secretary to waive the moratorium with respect to northern sea lions, harbor and spotted seals, ringed seals, bearded seals, ribbon seals, and beluga whales, and return management of these species to the State. A similar request has been made of the Secretary of the Interior with respect to walrus, sea otter, and polar bear. The NMFS and the U.S. Fish and Wildlife Service are jointly considering the request and have issued a draft environmental impact statement (DEIS) covering all species requested. This DEIS was filed with the Council on Environmental Quality on March 5, 1976. Consideration of the waiver will involve an agency hearing before an Administrative Law Judge regarding the extent of a waiver that may be granted and whether State laws and regulations are consistent with the purposes and policies of the Act under Section 109 before management can be returned to the State.

A major problem in preparing the DEIS related to application of the terms "optimum sustainable population" (OSP) and "optimum carrying capacity" as used in the Act. The major objective of the Act in the management of marine mammals is to not permit such species and population stocks "to diminish beyond the point at which they cease to be a significant functioning element in the ecosystem of which they are a part," and, consistent with this major objective, they should not be permitted to diminish below their OSP. There is not yet wide agreement within the scientific community as to exactly what OSP means or its relationship to maximum sustainable yield. Another problem in preparing the DEIS was the lack of pub-

lished scientific information on some species of marine mammals involved in the Alaska request for a waiver.

Legal Actions Brought Against the Department of Commerce

During this reporting period there were further developments in several legal actions discussed in the last annual report, as well as several new actions initiated. These actions related to the administration of the Act by NMFS. These cases are:

Committee for Humane Legislation v. Dent, et al.—Civil Action No. 74-1465 (D.C. D.C. 1974)—This suit, discussed in an earlier report, was filed October 4, 1974, for preliminary and permanent injunctions forbidding the issuance of general permits that will allow commercial fishermen to take marine mammals. The case was merged with a suit filed in February 1975, *Fund for Animals, et al. v. Dent, et al.*—Civil Action No. 75-0227 (D.C. D.C. 1975). Plaintiffs filed a motion for summary judgment on January 23, 1976; Defendant DOC, along with Defendant—Intervenor American Tuna-boat Association, filed cross-motions for summary judgment on February 20, 1976. On March 9, 1976, a hearing was held before Judge Richey of the U.S. District Court for the District of Columbia, concerning the motions. There being no facts in dispute, both parties claim judgment as a matter of law. A decision with respect to the motions for summary judgment is pending.

Loesche v. Department of Commerce—Civil Action No. C-75-10—(E.D. Washington 1975). This case, also discussed in the previous report, challenged the constitutionality of the Marine Mammal Protection Act on the grounds that there were no facts to warrant the imposition of a moratorium on the taking of all marine mammals, and that the plaintiff was denied due process because the Act made his occupation illegal. Government's motion to dismiss granted in February 1975.

State of Washington, et al. v. Elliot Richardson, et al., No. C76-57T (W.D. Washington, 1976). This action arose out of the capture on March 6 and 7, 1976, of a small pod of killer whales (*Orcinus orca*) in Budd Inlet, Olympia, Washington, by an employee of Sea World, Inc. Sea World operates marine aquaria and is the holder of a valid permit issued by the National Marine Fisheries Service which authorizes the capture of up to four killer whales for purposes of public display. The capture took place within view of several hundred persons and was the subject of considerable public interest. The State sought the release of the whales. The case was dismissed with stipulations by the parties that: Sea World was to deliver the two killer whales taken to the holder of a valid research permit who would release the animals within 60 days; and that the two whales taken would not count against the four Sea World is authorized to take. Additionally it was agreed that Sea World would not exercise its right under the current permit or subsequent permits to take killer whales

within the waters of the State of Washington.

Animal Welfare Institute, et al. v. Elliot Richardson, Robert W. Richardson—Civil Action No. 76-0482 (D.C. D.C. 1976); Committee for Humane Legislation, et al. v. Elliot L. Richardson—Civil Action No. 76-0484 (D.C. D.C. 1976). The actions seek 1) a declaratory judgment that the decision of the Director, NMFS to waive the moratorium to allow the importation of Cape fur seals from the Republic of South Africa contravenes the Marine Mammal Protection Act and is invalid, void and of no effect; and an injunction restraining defendant from taking any steps which give effect to the aforementioned decision.

Save the Dolphins v. U.S. Department of Commerce—Civil Action No. 74-00 (ND California 1974)—Suit, discussed in previous reports, concerned status of a search film on the incidental take of porpoise in commercial fishing operations. Film was ordered released by the Judge following deletion of portions containing information subject to Freedom of Information Act (b) (4) (5 U.S.C. 552(b) (4) exemption and requirement that film released to public only after subtitles added which state that film did not depict typical fishing operations but rather research operations. No appeal was filed and the case was dismissed December 1975.

Legal actions brought against the Department are indicative of problems being encountered in the administration of the Act. As pointed out in other portions of this report, significant problems have been encountered in implementing some of the provisions of the Act.

For example, the concept of optimum sustainable population as defined by the Act is subject to multiple interpretation. Scientists continue to have difficulty making this concept operational in practice.

There are significant conceptual differences regarding other terms of the Act. For example, "health and stability of the marine ecosystem" cannot be defined in terms of unchanging conditions. Natural population fluctuations occur in ecosystems unaffected by human intervention.

Efforts are continuing to resolve the very difficult management and protection issues involved. Until such time that clearer understanding can be reached, problems in administering the provisions of the Act can be expected to continue.

Discussions have been held with the Marine Mammal Commission and the Council on Environmental Quality regarding these definitional problems. Because of their complexity, no final solutions have been reached. Discussions will continue, and depending on the outcome, modifications of the Act may be in order.

Law Enforcement

The activities of the NMFS Law Enforcement Division remained at a high level during the period of this report. Public awareness of the Act's provisions continued to increase. The five NMFS regional law enforcement offices recorded

total of 20,174 man-hours in responding to requirements of the Marine Mammal Protection Act during the reporting period.

Enforcement activity of the Northeast, Northwest, Southeast, and Alaska Regions of NMFS centered around illegal taking of marine mammals, monitoring of ports of entry to detect importation violations, and illegal sale of marine mammal products, including scrimshaw. Tuna-porpoise responsibilities continued to receive emphasis in the Southwest Region.

Special agents initiated 218 investigations into alleged violations of the Act, resulting in the documentation of 116 violations. Seventy-two cases were closed through the assessment of civil penalties, in addition to forfeiture of the seized contraband. Sixteen cases involving insufficient documentation accompanying the items at time of importation were resolved through substantiation of their pre-Act status or subsequent compliance with necessary certification requirements, and 37 cases were closed as unfounded. At present there are approximately 93 cases pending, which includes 7 cases in which hearings have been requested. Of the 116 documented violations for this period, a total of 81 seizures involving 629 illegal items was made. The remaining 35 violations involved illegal takings, such as harassment, which generally do not concern a tangible, seizable object.

Two U.S. citizens were indicted by a Federal grand jury in Miami, Florida, on November 13, 1975, on 32 counts involving alleged violations of the NMMPA, including conspiracy to violate the Act. Charges against the men resulted from an intensive investigation by NMFS special agents, in cooperation with Bahamian authorities, which disclosed that the defendants were engaged in the illegal capture of 21 Atlantic bottlenosed dolphins (*Tursiops truncatus*) on the high seas from an operations base in the Bahamas. The animals were sold commercially to Canadian and European marine mammal public display attractions. Trial is scheduled for May 1976.

The Regulations Governing the Taking and Importing of Marine Mammals were amended on November 24, 1975, (Appendix G) in order to: (1) simplify the procedures for hearings authorized by Section 105 of the Act; (2) facilitate the holding of hearings in areas where administrative law judges are not readily available; and (3) provide those persons alleged to have violated the Act with a prompt hearing with respect to such violations. The amendment, specifically, deleted the term "administrative law judge" from Sections 216.53 through 216.60 of the Regulations, and substituted the term "presiding officer." Since the Act does not require the use of an administrative law judge, the regulatory change does not conflict with the Act's mandate.

Recently, NMFS special agents seized 500 fur sealskins which were illegally imported into the United States from South America. The investigation of the principal is continuing at this time.

In addition to direct involvement in enforcement of the Act, NMFS law enforcement personnel conducted many training and familiarization presentations with various industry and fishermen's groups, State and Federal law enforcement agencies, and civic and student groups. As public knowledge of the existence and purposes of the Act continues to increase, interest on the part of nonfisheries-related groups and individual citizens has shown a notable increase.

The NMFS continued to work closely with State agencies to attain nationwide compliance with the provisions of the Act and to ensure that State efforts in marine mammal enforcement activities, as provided for in several cooperative enforcement agreements, were continuing to be effective and commensurate with contract requirements during FY 1976. Contracts, which provide funds for enforcement of the Marine Mammal Protection Act of 1972, were renegotiated with Alaska, California, Washington, Oregon, and Florida, at a total cost of approximately \$445,000.

International Program

The International Marine Mammal Program, as carried out by the National Marine Fisheries Service, is continuing its efforts to achieve the objectives of the Marine Mammal Protection Act through international cooperation. The following details the principal thrusts of the international program during this past year.

INTERNATIONAL WHALING COMMISSION (IWC)

At the 27th Session of the International Whaling Commission (IWC), June 23-27, 1975, the United States indicated continuing support for a 10-year moratorium on all commercial whaling. Such a moratorium was not adopted by IWC but rather a "New Management Procedure" was established and subsequently all member nations of the IWC, including Japan and the Soviet Union, have agreed to abide by all the conservation measures. This procedure calls for a moratorium on the taking of any stock of whales which is not at or near maximum sustainable yield (MSY) and later, when such can be determined, at optimum levels. Although the basis for the "New Management Procedure" continues to be maximum sustainable yield with the addition of safety factors, the goal of the IWC and its scientific Committee is to establish catch limits on the basis of "optimum levels"—taking into consideration the "interactions within marine ecosystem." This is clearly recognized in the agreed language in the Schedule of the IWC Convention.

While the new management approach is a recognized compromise for the United States, it shows significant progress and is a desirable basis from which to achieve greater forward motion in the conservation of the world's whales. The new approach has resulted in a moratorium on the taking of fin whales worldwide with two minor exceptions, one in

the Antarctic and one in the North Atlantic. Moratoria are also in effect on the taking of sei whales in the North Pacific and in one area of the Antarctic and on populations of male sperm whales of Eastern Australia. Most of these moratoria are expected to last longer than 10 years.

The total of the 1975-76 season catch limits approved utilizing the new approach resulted in a reduction of about 8,500 whales from the catch limits adopted for the 1974-75 seasons. In addition, coverage of whaling operations previously not regulated by the IWC was achieved, i.e., North Atlantic fin and minke whales and land station catches of minke, sei, and Bryde's whales in the Southern Hemisphere.

Other major activities connected with the IWC have been (1) efforts to encourage both whaling and certain non-whaling nations currently not members of the IWC to become members, and (2) special scientific meetings to examine the status of stocks of sperm whales and whales of the North Atlantic to determine if additional protective measures are indicated.

FOOD AND AGRICULTURE ORGANIZATION (FAO)

The task before the Advisory Committee on Marine Resources Research (ACMRR) Working Party on Marine Mammals to objectively examine all data available on the status of all marine mammals is close to completion by the experts. All four groups of experts—Group I (Large Whales), Group II (Small Cetaceans and Sirenians), Group III (Pinnipeds and Sea Otters), and Group IV (Ecological Aspects)—have met, and reports are in varying stages of completion. Reports of the first three groups will describe (1) the status of marine mammal populations and (2) research priorities in each of the three marine mammal groupings. Research priorities are designed to provide information needed for proper conservation of all species. The review of status of marine mammal populations was conducted through specifically prepared scientific papers which are part of the reports of the first three groups.

The Scientific Consultation on the Conservation and Management of Marine Mammals and Their Environment to be held in Bergen, Norway, August 31 to September 9, 1976, is the final step in ACMRR's responsibility to provide an objective report on status of marine mammals to FAO. The Consultation will be attended by a large number of scientists from around the world. These scientists will critically review and discuss the reports of Groups I, II, and III on status of all species. Other major discussions of the Consultation will involve consideration of the ecological relationships of marine mammals. Research proposals concerning marine mammals will be reviewed and assembled into a single worldwide program. The final report and recommendations of the Consultation will be published.

INTER-AMERICAN TROPICAL TUNA COMMISSION (IATTC)

At the 1975 Annual Meeting of the IATTC, the United States continued its efforts to achieve international action to reduce the incidental take of marine mammals. As in past years, the United States stressed the importance of the problem of the incidental kill of porpoises during tuna purse seine operations, explained and made available copies of the 1976 domestic regulations affecting U.S. fishermen, and urged the countries in attendance to adopt comparable measures.

The United States again asked the Director of Investigations to comment on the possibility of making recommendations to member countries regarding the use of fishing methods and gear which available research indicates is effective in reducing the incidental marine mammal mortality and serious injury rate. The Director indicated that the IATTC Convention could be interpreted as authorizing the scientific staff to be involved in research concerning the tuna-porpoise relationship; however, under the current budget the Commission does not have the resources to embark on a significant porpoise research program.

Noting the limitations of the present budget and not desiring to divert funds from the present program of tuna research, the Commission instructed the Director of Investigations to develop a program of tuna-porpoise research with estimates of the fiscal and personnel resources necessary to carry out the program.

The United States also asked for a discussion of the possibility of arranging for a mutual observer program at some point in the future. Responses from various countries indicated a willingness to transmit to their governments any information on such a program.

The United States described the U.S. gear research made possible in 1975 through the Commission's approval of a 1,000-ton allocation of the IATTC quota to the United States for this purpose. Emphasizing the need for the continuation of such research, the United States requested and was granted an additional 1,000-ton allocation for gear research in the Commission Yellowfin Regulatory Area during 1976.

Culminating the discussions, Mexico proposed a resolution which was passed by the Commission supporting joint agreements between the Commission and any country to conduct research concerning the tuna-porpoise problem.

U.S.-U.S.S.R. MARINE MAMMAL PROJECT, ENVIRONMENTAL PROTECTION AGREEMENT

The objective of the international marine mammal project is to develop collaborative research on the biology, ecology, and population dynamics of marine mammals of mutual interest to both nations that will contribute toward sound management and conservation of these animals.

Two Soviet scientists worked on porpoise morphology and taxonomy with the porpoise research program at the Na-

tional Marine Fisheries Service, Southwest Fisheries Center, from mid-April to mid-May 1975.

A project meeting was held in Leningrad, U.S.S.R., on June 2-12, 1975. Principal accomplishments were: final agreement for coordinated aerial surveys of bowhead whales and walrus in the Bering and Chukchi Seas in the fall of 1975; final agreement for participation of at least two and possibly four U.S. scientists in the spring of 1976, walrus-ice seal cruise in the Bering Sea. (final arrangements were concluded in January 1976, with three U.S. scientists participating in the ice edge studies aboard the Soviet vessel *Zagoranyi* from mid-March to early May 1976), and agreement to hold the walrus-ice seal biology meeting in January 1976 in Moscow.

The special Conference on Walrus and Ice Seal Biology convened by the U.S.-U.S.S.R. Marine Mammal Project was held in Moscow, U.S.S.R., January 12-20, 1976.

The Protocol summarized the direction of a long-range research plan for walrus and ice seals. The Protocol calls for increased emphasis on studies at the community and ecosystem levels, evaluation of current aerial survey techniques, and development of joint studies in Alaska and the Chukotka region of Siberia. Special attention was drawn to the Bering Strait region as an important location for studying migratory species such as bearded seals.

The Conference reached agreement on a system of standard measurements for pinnipeds that would be used by both U.S. and Soviet scientists and agreed to take up standardization of cetacean measurements at the next Project meeting.

The need for a conservation convention on walrus and ice seals was discussed at length. The Soviets pointed out that national protective measures by both nations during the past decade had reversed the declining population trends of walrus and ribbon seals and that the populations of all five species dealt with were either increasing or already high and stable. The United States discussed the need for international management of these pinniped species, particularly in view of potential environmental degradation. The Soviets wanted additional time to consider the issues involved. Therefore, it was agreed that the question would be reconsidered at the next Project meeting.

NORTH PACIFIC FUR SEAL CONVENTION (NPFSC)

In accordance with the terms of the present Interim Convention on Conservation of North Pacific Fur Seals, the United States continued to share the harvest of fur sealskins from the Pribilof Islands with Canada and Japan. The United States also continued land research and the analysis of pelagic research data collected in previous years. The moratorium on the commercial harvest of fur seals on St. George Island, for the purpose of facilitating intensive study of the factors which govern

the survival of fur seals, remained effect.

The first North Pacific Fur Seal Conference called to renegotiate the Interim Convention took place in Washington D.C., in March 1975. No general agreements regarding alternatives to the present Convention were reached at the time. In the succeeding months, further discussions were held by NMFS with the Marine Mammal Commission, Congressional staff, and with representatives of various private organizations. One result of these discussions was a jointly prepared document explaining the optimum sustainable population concept which the United States proposed at the March Conference be included in a renegotiated Convention.

At the December 1975 Conference, the delegates resolved to recommend to the respective Party governments that they amend the Interim Convention by concluding a Protocol conforming to a draft agreed to at the Conference by the representatives of the Parties. The Interim Convention will terminate in October 1976 under its present terms. The Protocol, if approved, will extend the Convention for 4 years and make certain revisions. Recommended revisions relate to the use of humane methods of marking and harvesting seals, meeting subsistence needs of the native population, research on the relationship between fur seals and other living marine resources, as well as research on the effects of man-caused environmental changes on the fur seal populations. An additional recommended revision would provide for a reduction or suspension of the fur seal harvest on any island or group of islands if the total number of seals on an island or group of islands falls below the level of maximum sustainable productivity.

The United States was unable to obtain unanimous agreement on the inclusion of an optimum sustainable population management concept in a revised Convention. Because of the lack of agreement on this issue, the United States supported an extension of the agreement for only 4 years. Furthermore, in consideration of the need for flexibility in view of possible changes in fisheries jurisdiction in the future, the United States supported the inclusion of language allowing a Party to call for a meeting of representatives of the Parties within 90 days of such request to consider modifications of the Convention, and, if necessary, terminate the Convention with 1 year written notice to the other Parties. These provisions are included in the draft Protocol approved by the December Conference.

The 19th Annual meeting of the NPFSC held in Moscow, U.S.S.R., March 22-26, 1976. The meeting was preceded by a meeting of the standing scientific committee, March 15-19, 1976. Research plans for 1975 and 1976 were reviewed. The prohibition on pelagic sealing for commercial purposes was continued. Recommendations were made on the 1976 commercial harvest, and discussion carried out on the problems of

fur seal entanglement in debris discarded at sea. The United States noted its intentions to harvest up to 200 fur seals on St. George Island in 1976 for subsistence purposes. This harvest will be taken under close supervision with a view to obtaining the best biological information and will not interfere with the ongoing St. George research programs and commercial harvest moratorium.

INTERNATIONAL COMMISSION FOR THE NORTHWEST ATLANTIC FISHERIES (ICNAF)

At a special meeting of the ICNAF in January 1976, the Commission approved a 1976 hood seal quota of 15,100 seals and a 1976 quota of 127,100 harp seals, reduced from 150,500 in 1975. Harp seal quotas were allocated to Canada and Norway and indigenous nonmobile fisheries. Hood seal quotas were allocated to Canada and Norway. The Commission also agreed on seasons and open times for the taking of harp and hood seals. Furthermore, the Commission agreed to prohibit the killing of adult harp seals in whelping patches in designated Convention areas off the coast of Canada and the killing of whelping hood seals in the Davis Strait from vessels of over 50 gross tons. In view of the fact that the harp and hood seal proposals would not have entered into force during the open season under normal approval procedures of the Convention, the Commission approved a recommendation that the regulations enter into effect on March 12, 1976, the beginning of the open season for harp seals in one area. Although a member of ICNAF, the United States does not participate in any Atlantic sealing. The United States is not a member of the special ICNAF panel which deals with harp and hood seals, although a U.S. observer has attended panel meetings.

CONVENTION ON THE CONSERVATION OF ANTARCTIC SEALS

The final Environmental Impact Statement (EIS) on the Convention was forwarded to the Council on Environmental Quality. Since the EIS, concurred in by all Government agencies, concluded that the Convention is consistent with the Act, the Department of State sent the Convention to the White House on November 12, 1975, for transmittal to the Senate. The White House subsequently sent the Convention to the Senate recommending ratification on December 17, 1975. As of the end of the reporting period it had not been ratified.

INTERNATIONAL INQUIRIES TUNA-PORPOISE

In July 1975 the United States transmitted inquiries to governments whose vessels fish for yellow fin tuna in the Atlantic and Pacific Oceans, requesting information from those countries believed to have experience with tuna fishing on porpoise populations. Specifically, the United States asked: 1) whether the vessels of certain countries fish for tuna by setting on schools of porpoise in the Atlantic and, if so, to what extent this fishing method has been employed and in what areas; 2) what research programs

are underway or under consideration on specialized gear technology intended to reduce or eliminate the incidental take of porpoise in the tuna fishery; 3) what mechanics are in effect at this time to regulate the incidental take of marine mammals by vessels in the Atlantic and Pacific yellowfin tuna fishery; and 4) whether it might prove useful to hold future discussions on the possibility of arranging a mutual observer program in connection with the incidental take of porpoise by vessels fishing for yellowfin tuna in the eastern tropical Pacific Ocean.

Responses to the transmittal were received from Mexico, Nicaragua, Canada, Ivory Coast, and Korea. Nicaragua and Korea noted that they have no purse seine vessels fishing for tuna and thus the incidental take of porpoise is not a problem. The Ivory Coast pointed out that the incidental capture of porpoises by fishing vessels is unusual in the Gulf of Guinea and certainly does not endanger the local population of porpoises. Information received from Mexico emphasized that the mechanisms in effect on Mexican vessels to reduce the incidental take of porpoises include the porpoise safety panel and the use of the backdown procedure. No research programs are underway or under consideration on specialized gear technology. Canada noted that Canadian vessels also use the Medina panel and the backdown procedure, but Canada is not in a position to undertake research programs on specialized gear technology. With regard to observers, Canada pointed out that observers were aboard two of its five vessels and the operations were considered satisfactory.

UNITED STATES-MEXICO SCIENTIFIC MEETING

Scientists of the United States and Mexico met in La Paz, Mexico, January 19-21, 1976, to discuss research needs for a better understanding of marine mammal issues of mutual concern to both countries. Subjects discussed at the meeting included the status of marine mammal stocks of mutual concern, particularly the gray whale and their calving in the lagoons of Baja California, the Gulf of California harbor porpoise, and the manatee. Other subjects discussed were porpoise mortality incidental to the tuna fishery, the merits of introducing set otters along the coast of lower California, and the possibility of cooperation between U.S. institutions and the Centro de Investigaciones Biologicas de la Paz, Mexico.

LAW OF THE SEA

NOAA/NMFS continued to support the inclusion of language expressing the intent of the Marine Mammal Protection Act in economic zone articles which might result from the third United Nations Conference on the Law of the Sea. Since the last Report on the Administration of the Act, an informal Single Negotiating Text, intended to provide a basis for negotiations, has been prepared by the Main Committee of the Conference

concerning the economic zone. This text includes language concerning marine mammals.

Enactment of Fishery Conservation and Management legislation which would extend the U.S. boundary of the fishery conservation zone to 200 nautical miles is expected in April of 1976. The legislation would amend the Marine Mammal Protection Act of 1972 to encompass the waters within 200 miles. The effect of the amendment will be that incidental or deliberate take of marine mammals by foreign fishermen permitted to fish inside the fishery conservation zone must be in conformance with the Marine Mammal Protection Act.

Research Program

TUNA-PORPOISE RESEARCH AND DEVELOPMENT

The marine mammal program at the NMFS Southwest Fisheries Center (SWFC) is concerned with oceanic porpoise populations and their relation to the tuna fishery. The major objective of the program is to carry out NMFS responsibilities under the Marine Mammal Protection Act of 1972, especially in respect to Sections 101(a)(2), 103(b) and (d), and 111.

The research program has been developed along the general philosophy, priorities, and organizational structure outlined in the "Report of the NOAA Tuna-Porpoise Review Committee" of September 1972, and subsequent advice of the Committee of Scientific Advisors of the Marine Mammal Commission. Accordingly, the first priority is to reduce the porpoise mortality and serious injury rate that is incidental to tuna purse seining as rapidly as possible. The secondary goals are: (1) to generate baseline biological data on porpoise populations in the eastern tropical Pacific, and (2) to establish the status of these populations. The two major components of the NMFS program are gear dynamics and development, and biology and stock assessment. The gear dynamics and development program, although managed from the SWFC, is based on the input and expertise of specialists from the Northwest Fisheries Center (NWFC) at Seattle. The biology and stock assessment work is carried out at the SWFC.

It is generally accepted that the ultimate solution of the tuna-porpoise problem is a technological one. Toward that end NMFS has been successful in securing increased funding in FY 1976 to strengthen the research effort. In addition a joint program of research has been developed by the tuna industry, the Marine Mammal Commission and NMFS, which provided for an immediate expansion of research into porpoise mortality reduction, relating primarily to gear testing and behavioral studies. This cooperative research effort will result in an overall expanded, better coordinated, and effective research program on ways to reduce porpoise mortality.

Gear Dynamics and Development.—Several significant advances have been made in gear research during the report-

ing period. Perhaps the most important experiment involves what has come to be called the Bold Contender system. This system is designed to reduce backdown and postbackdown related mortality. The system consists of the porpoise apron-chute complex, the porpoise grabber, and a one-man life-raft for use as a porpoise rescue platform.

The apron-chute complex has evolved from the porpoise apron—a long trapezoidal-shaped strip of small-mesh webbing added to the net along the top of the required porpoise safety panel. The basic apron was developed in the fall of 1974 and placed aboard nine volunteer vessels in the spring and summer of 1975 for testing. The apron provided a shallow area at the backdown apex where the porpoise were released. This shallow area prevented:

(1) fish from "boiling" directly beneath the porpoise which drives the porpoise away from the opening and (2) fish from escaping over the corkline, because the porpoise physically block the exit. There was general agreement among the participating captains that the porpoise apron aided the release of porpoise but that a learning or familiarization period was required on the part of the captains for its proper deployment. All of the participants have kept the apron in their nets after the test cruises.

To maximize the positive aspects of the porpoise apron idea, an additional, more sharply tapered trapezoidal strip of small-mesh (1 1/4" stretch mesh) webbing was laced to the top of the porpoise apron thus producing the apron-chute complex. The apron-chute complex was placed atop a double depth 1 1/4" stretch mesh webbing safety panel and taken to sea for testing in September–November of 1975 aboard the tuna vessel *Bold Contender*. After a suitable learning and adjustment period this net, in combination with a small liferaft as a platform for hand release of the porpoise, produced an extremely low kill rate. In 25 sets involving porpoise there were 15 sets where no porpoise were killed.

At the same time, another vessel was equipped with one strip of small-mesh safety panel and an apron without the chute. Although a variety of operational problems encountered during this cruise complicated the evaluation of the apron performance, the kill was substantially reduced when compared to that for a commercial fishing trip early in 1975 on the same vessel. Both of the fall 1975 cruises showed conclusively that porpoise only rarely become entangled in webbing of 1 1/4" stretch mesh size.

The NMFS, Marine Mammal Commission and the Tuna Industry concluded a cooperative research agreement whereby the Government agreed to match industry funds on a two-to-one basis. The Tuna Industry contributed \$250,000, NMFS \$450,000, and the Marine Mammal Commission \$50,000. The Industry and NMFS funds are being used primarily for field testing of gear including the Bold Contender system and a Small-mesh Safety Panel System. Marine Mam-

mal Commission and a portion of the NMFS funds will be used for porpoise behavioral research studies.

The joint NMFS/Industry test of the Bold Contender system versus nets with only double depth small-mesh safety panels, involving 16 to 20 volunteer vessels, began in February 1976. Each vessel carries a small liferaft to be used as a porpoise rescue platform before, during and after the backdown procedure. Field technicians will be aboard to gather data on the performance of all gear and methods used.

During the summer of 1975, the "large volume" net designed to alleviate porpoise mortality caused by crowding was lengthened and taken to sea under competitive fishing conditions in the non-regulated yellowfin tuna area of the Central Pacific. After some initial problems with net canopies, the incidental mortality rate for porpoises fell to encouraging levels. The three strips of 1 1/2" stretch mesh porpoise safety panel in the large-volume net were reported to have prevented large kills in at least two net sets in very rough weather. The net is now engaged in exploratory fishing in the Western Pacific with excellent success reported. Although this latest trip is not associated with "porpoise fishing," its success in "school fishing" (nonporpoise) is an important prerequisite to acceptance of the net by industry.

The antitorque purse cable that was designed to reduce net roll-ups, which delay fishing operations and endanger captured porpoises, is continuing to be used aboard two seiners. Also, during the reporting period, gear experts have briefed tuna vessel captains at required formal training sessions on the latest developments in techniques and gear that will enable them to implement the provisions of the Act.

As evidenced earlier, industry representatives and fishermen are showing increasing awareness and cooperation in creating and evaluating the several promising approaches to resolving the incidental porpoise mortality problem. Research and development in porpoise mortality reduction technology is progressing steadily toward practical solutions to this most urgent problem.

Biology and Stock Assessment.—Both the biological and stock assessment activities of the SWFC's tuna-porpoise program rely heavily on specimens and information collected by the scientific observers who, since the fall of 1975, have operated under the Southwest Regional Office at Terminal Island, California. In addition to their management duties they collect specimens and samples aboard U.S. tuna seiners for life history studies and stock assessment, and make certain other observations on cetaceans and birds. They also record data on numbers and species of porpoise encountered, set upon, and killed, and make detailed observations of the capture and rescue operations.

Biological research during the period concentrated on estimation of important life history parameters of the major por-

poise species involved in the tuna fishery. Using specimens and data collected aboard commercial tuna seiners and standard techniques and analyses, biological studies staff at Southwest Fisheries Center completed estimates of parameters of growth and reproduction of the spotted dolphin, *Stenella attenuata*, the most important species in the tuna fishery, and produced a manuscript for publication. The parameter estimates were used in the assessment of the impact of the tuna fishery on the stock of spotted dolphins. The biological studies staff also completed processing of data and specimens collected from spinner dolphins, *Stenella longirostris*, kill during fishing operations and produced preliminary estimates of life history parameters for that species. Two forms of the spinner dolphin are involved in the tuna fishery, the eastern spinner and the whitebelly spinner, and the preliminary studies indicate that the two forms differ in growth and reproductive characteristics.

The limits of the ranges of the stock of *Stenella* spp. in the eastern Pacific and the oceanographic or ecological bases for these limits are still poorly known. For this reason, SWFC fielded two research vessels, *R/V Townsend Cromwell*, based in Hawaii, and *R/V David Starr Jordan*, based in San Diego for 2 months, January and February 1976, to skirt and transect the known limits of the historical ranges of the species, to collect data on (1) limits of concurrence and estimates of school density, for possible use in new population estimates, and (2) physical oceanographic and faunistic correlations of the occurrences of dolphins and of the occurrences of dolphins and tuna, which data may lead to construction of models predicting distribution based on oceanographic data.

Porpoise stock assessment studies undertaken by NMFS are designed to determine the current status of spotted dolphin stocks, projections of the status of these stocks given present technology employed in the tuna fishery, and projections of the status of stocks under alternative management strategies and proposed changes in gear technology. Similar studies will extend these considerations to the spinner dolphin and the common dolphin.

Combined information from a 1975 aerial survey and data collected by NMFS observers used to make preliminary estimates of the density and abundances of the stocks of the two major species involved, the spotted and spinner dolphin. The estimates require assumptions which were not investigated in 1974 regarding: (1) the average number of porpoises per school, and (2) the density of porpoise schools in unsurveyed areas. The studies of the present year examined the critical assumptions and improved the quality of the estimates. Survey data were also obtained from operations of the 1975 tuna fleet. The results of these surveys are now being used to refine assumptions of the previous

year's analysis to further improve the estimates of density and abundance made for 1974. Results also are being used to make new estimates of density and abundance and search for any trends that might exist.

Provisional estimates of the impact of incidental mortality upon the spotted dolphin have been made with the Leslie matrix model. The model requires age specific mortality and fertility rates which are obtained from the results of the biological investigations. In conjunction with the impact analysis, assumptions concerning the composition (sex, age, etc.) of the observed kill in relation to the total kill and to the population were examined. Preliminary estimates of the impact of incidental mortality on the spotted dolphin indicate that the rate of change in abundance was small or zero, but several critical points must be analyzed. Using cursory data, the rate of change in abundance of the spinner dolphin was provisionally found to be small or zero, as well. However, age-specific biological data must be employed before the analysis can be conclusive. Impact analyses for both spinner and spotted dolphins rely on presently unverifiable assumptions that the incidental kill rate of foreign fleets is the same as that for the U.S. fleet.

NORTHERN FUR SEAL, PINNIPED, AND CETACEAN RESEARCH

The Marine Mammal Division of the NMFS, Northwest Fisheries Center, conducts three principal research programs. The northern fur seal program consists of monitoring studies on the status of the fur seal herds; basic population dynamics studies, as well as behavioral and ecological research in accordance with the provisions of the interim convention for the Convention of Northern Fur Seals. St. George Island has been established for an indefinite period as a no-harvest research control area for comparative studies with the harvested fur seal population on St. Paul Island.

The pinniped and cetacean programs are aimed primarily at assessing the status of the stocks and obtaining life history information about such species as the bowhead, killer, and humpback whales; commercially harvested species of large whales; and California sea lions. Although the primary geographic area of concern is the North Pacific Ocean including the Bering and Chukchi Seas and the Arctic Ocean, the Marine Mammal Division maintains an interest in marine mammal research throughout the world.

Northern Fur Seal Program.—Long-term objectives of the northern fur seal program are to determine what measures may be necessary to make possible maximum sustainable productivity and to determine the relationship between fur seals and other living marine resources. Monitoring activities are designed to

build a data base on population structure essential to management of the resource. Included are counts of living adult males and of dead pups on land, and determination of the number of pups born and the age composition of harvested seals.

Behavioral research (concentrated in the St. George Island Research Control Area Study) involves the identification and quantification of behavioral components that may act to control population size. Studies include experiments on the length and regularity of female feeding cycles and on the female estrus cycle. The program also conducted research on the male and female ratio in the herd, and on predation by northern sea lions on fur seal young. Radio telemetry was used to define the movement patterns of subadult males on hauling grounds. Through a contract with Scripps Institution of Oceanography the diving and feeding effort of female fur seals on normal feeding excursions was measured using a new depth-time recorder.

Pelagic studies provide age-specific pregnancy rates essential for calculating the productivity of the fur seal resource, determining changes in pregnancy rates at various population levels and sex ratios, and determining changes in average age of fur seal pregnancy at various population levels. These studies also yield information on the distribution, movement, and mingling of fur seal populations at sea, and on fur seal feeding habits as a basis for understanding the relationship of fur seals and commercial fisheries.

An ecosystem study of the Bering Sea has placed initial emphasis on the fur seal-pollock relationships. Pelagic fur seal studies provide data on feeding habits and distribution for the ecosystem analysis.

Population dynamics studies are correlated with behavioral research and are aimed at determining how survival relates to changes in abundance of the fur seal population in order to determine an optimum population level.

A program of physiology and medicine involves a determination of causes of death among pups, development of new methods of marking fur seals, and research on the infectious diseases of fur seals. Research on the latter was contracted to the Naval Biomedical Research Laboratory, Oakland, California.

Pinnipeds of the U.S. Pacific Coast.—Biological and population studies are being carried out on the six species of pinnipeds which haul out on San Miguel Island, one of the Channel Islands of Southern California. Special attention is being given to determining the cause of premature births in California sea lions. The number of fur seal pups counted in Adams Cove, San Miguel Island, increased to 329, an increase of 109 over 1974. On Castle Rock, 396 pups were counted which was an increase of 95 over the 1974 count.

Marine Mammals of the Arctic Ocean and Bering Sea.—Arctic Ocean and Bering Sea studies emphasize assessment of the bowhead whale populations and the

effect of the Eskimo whaling on the populations. Information on the population and abundance of marine mammals in the Gulf of Alaska, Bering Sea, Chukchi Sea, and Beaufort Sea is being collected under the Outer Continental Shelf Energy Program sponsored by the Bureau of Land Management.

Cetaceans.—Population studies of protected and exploited whales such as sei, minke, and sperm whales, especially in the North Pacific Ocean, are conducted to develop the data base for management recommendations to the International Whaling Commission. Estimates of stock sizes of large whale species are developed through censuses, whale observation and marking cruises, and analysis of catch and effort statistics. The annual gray whale census off Pt. Loma, California, the cooperative killer whale survey in Puget Sound, Washington, and humpback whale surveys in southeastern Alaska and Hawaii are conducted under this program.

Funding

The FY 1976 Marine Mammal Conservation total budget is 76 positions and \$3,392,000 (Appendix H). The FY-1976 totals include: in Marine Mammal Protection Act appropriations, 62 positions and \$2,797,000 for Research, Administration and Enforcement, in accordance with the provisions of the Act; and in Fur Seal Act appropriations, 14 positions and \$595,000 for research and management associated with the North Pacific Fur Seal herds.

The FY 1977 totals include: Marine Mammal Protection Act appropriations, 60 positions and \$3,533,000, of which 4 positions and \$1,030,000 is requested increase funding; Endangered Species Act appropriations of 6 positions and \$294,000 for enforcement and research associated with the Great whales; and Fur Seal Act appropriations of 14 positions and \$595,000. The FY 1977 total will be 80 positions and \$4,422,000 should the requested increase be approved.

PART II.—CURRENT STATUS OF THE STOCKS OF MARINE MAMMALS

Introduction

Of the approximately 104 species of marine mammals throughout the world, status reports have been prepared for 69 species which are of primary concern to the United States and are the responsibility of the Secretary of Commerce under the terms of the Marine Mammal Protection Act. The Act requires a report not only on the status of each marine mammal species, but also on the population stocks. The population stocks of only a few marine mammals have been delineated and the effort needed to obtain information on most population stocks is beyond the scope of research being carried out at the present time.

Information about each species is summarized under six major headings. They are distribution and migration, abundance and trends, general biology, ecological problems, allocation problems, and current research. Selected references are listed at the end of each species discussion. Summary information on ex-

listing protective regulations for marine mammals is also included.

References are not cited in the report except for the paragraph on abundance and trends. Because of the importance of data on abundance and trends, information in this section is cited and citations are given in the list of references. Data on the abundance of marine mammals are difficult and costly to obtain. With the exception of a few species which have been commercially exploited, such as large whales and fur seals in the North Pacific Ocean, abundance data are usually inadequate for management purposes.

A list of scientists who have assisted either by providing information or reviewing the status reports is included in this report.

SPECIES LIST

PINNIPEDIA

Zalophus californianus californianus (California sea lion)
Eumetopias jubatus (northern sea lion)
Arctocephalus australis (South American (Cape) fur seal)
Arctocephalus pusillus (South African fur seal)
Arctocephalus philippi (Juan Fernandez fur seal)
Arctocephalus townsendi (Guadalupe fur seal)
Callorhinus ursinus (northern fur seal)
Phoca vitulina (harbor seal)
Pusa (-Phoca) hispida (ringed seal)
Halichoerus grypus (gray seal)
Histiophoca fasciata (ribbon seal)
Pagophilus groenlandicus (harp seal)
Erignathus barbatus (bearded seal)
Monachus tropicalis (Caribbean monk seal)
Monachus schauinslandi (Hawaiian monk seal)
Lobodon carcinophagus (crabeater seal)
Cystophora cristata (hooded seal)
Ommatophoca rossi (Ross seal)
Hydrurga leptonyx (leopard seal)
Leptonychotes weddellii (Weddell seal)
Mirounga leonina (southern elephant seal)
Mirounga angustirostris (northern elephant seal)

MYSTICETI

Balaena glacialis (black right whale)
Balaena mysticetus (bowhead whale)
Eschrichtius robustus (gray whale)
Balaenoptera acutorostrata (minke whale)
Balaenoptera edeni (Bryde's whale)
Balaenoptera borealis (sei whale)
Balaenoptera musculus (blue whale)
Balaenoptera physalus (fin whale)
Megaptera novaeangliae (humpback whale)

ODONTOCETI

Steno bredanensis (rough-toothed dolphin)
Tursiops truncatus (bottlenosed dolphin)
Grampus griseus (Risso's dolphin)
Lagenorhynchus albirostris (white-beaked dolphin)
Lagenorhynchus acutus (Atlantic white-sided dolphin)
Lagenorhynchus obliquidens (Pacific white-sided dolphin)
Platanista gangetica (Ganges dolphin)
Platanista minor (Indus River dolphin)
Lagenodelphis hosei (Sarawak dolphin)
Stenella attenuata frontalis, *graffmani*, and *dubia* (spotted dolphin)
Stenella plagiodon (Atlantic spotted dolphin)
Stenella longirostris (spinner dolphin)
Stenella coerulocalba (striped dolphin)
Delphinus delphis (common dolphin)
Lissodelphis borealis (northern right whale dolphin)

Peponocephala electra (melon-headed whale)
Peresca attenuata (pygmy killer whale)
Pseudorca crassidens (false killer whale)
Globicephala melaena (long-finned pilot whale, pothead, black fish)
Globicephala macrorhynchus (short-finned pilot whale)
Orcinus orca (killer whale)
Phocoena sinus and *Phocoena phocoena* (harbor porpoise)
Phocoenoides dalli (Dall porpoise)
Delphinapterus leucas (beluga whale, belukha)
Monodon monoceros (narwhal)
Physeter catodon (sperm whale)
Kogia breviceps (pygmy sperm whale)
Kogia simus (dwarf sperm whale)
Mesoplodon bidens (North sea beaked whale)
Mesoplodon europaeus (Antillean beaked whale)
Mesoplodon mris (True's beaked whale)
Mesoplodon stejnegeri (Bering Sea beaked whale)
Mesoplodon carlhubbsi (Arch-beaked whale)
Mesoplodon ginkgodens (Ginkgo-toothed whale)
Mesoplodon densirostris (dense-beaked whale)
Ziphius cavirostris (goose-beaked whale)
Berardius bairdi (giant bottlenose whale)
Hyperoodon ampullatus (North Atlantic bottlenose whale)

Status Reports

CALIFORNIA SEA LION

(*Zalophus californianus californianus*)

Distribution and Migration.—This subspecies of the California sea lion ranges along the west coast of Mexico from about lat. 21° N to southern British Columbia, Canada. The California sea lion breeds on some Gulf of California islands northward to San Miguel Island, California, in lat. 34° N. Many adult and subadult males move northward along the California, Oregon, Washington, and British Columbia coasts after the breeding season. Feral animals which have escaped from captivity are being reported in the southeastern U.S. (including the Gulf of Mexico) but there is yet no evidence of breeding (Caldwell, D.K., pers. com., 1974).

Another subspecies occurs on the Galapagos Islands and still another, formerly found in Japanese waters, is now extinct.

Abundance and Trends.—The California Department of Fish and Game censuses indicate that the California sea lion population reached a low level in the early 1930's in California waters, then made a steady recovery and apparently leveled off about 1961 with little variation in the counts since then (Ripley, Cox, and Baxter, 1962; Carlisle and Aplin, 1971). Rice, Kenyon, and Luch (1965) counted 16,150 California sea lions on Guadalupe, San Benito, and Cedros Islands, Mexico, in January and February 1965. Orr, Schoenwald, and Kenyon (1970) counted this species in the Gulf of California between 1960 and 1968, and made counts on six islands of about 5,400 animals in April of 1966. Brownell, et al. (1974) state they made counts in 1968 of 15,467 on four islands off Baja California. Odell (1971) obtained minimum counts of 34,382 California sea lions on all Channel Islands in June 1964. Peterson and LeBoeuf (1969) estimated that 40,000

animals were ashore on San Nicolas at San Miguel Islands during the 1967 and 1968 breeding seasons. Carlisle and Aplin (1966) obtained a total count in California of 22,000 animals in 1965, using aerial photography. The preceding figures indicate a total population of about 60,000 with near 20,000 animals in Mexico and 40,000 in the United States. Mate (pers. comm.) states that the California sea lion population in Oregon numbered about 2,500 in 1968, 1969, and 1970. As many as 1,000 animals migrate through Oregon to the north during these years.

On 25 February 1972, 430 California sea lions were counted in Barkley Sound off Vancouver Island, 35 on Race Rock off Victoria, B.C., and 10 in Dodds Narrows (lat. 49°07'N) near Nanaimo, B.C. (Bigg, 1973).

Before passage of the Marine Mammal Protection Act by the U.S. Congress, California sea lions were taken by state permit each year for sale to zoos, oceanariums and circuses. Daugherty (1972) states that 400 of these animals were taken in 1969 and 580 in 1970.

General Biology:

Species Statistics.—The adult male grows to 2.1 m and 273 kg; the adult female to 1.8 m and 91 kg. Newborn pups are about 0.8 m long and 5.4 to 6.4 kg in weight.

Reproductive Data.—On San Nicolas Islands, the pupping season begins about 15 May and lasts about 5 weeks, with the peak during the first week in June. The females usually breed 15 to 30 days after parturition and the mother and pup may remain together the first year. The males establish and defend breeding territories on land; the females move about freely.

Age-Growth Data.—California sea lions have lived 18 to 20 years in captivity.

Feeding Habits.—The California sea lion's food consists of squid, octopus, and a variety of fish such as herring, sardines, rockfish, hake, and ratfish.

Parasites and Diseases.—During the past 2 or 3 years an apparent increase in premature births and in the mortality rate of subadults and young adults has occurred. Three potential causes have been isolated: (1) chemical residues (polychlorinated biphenyls, DDT and metabolites); (2) a bacterium (*Leptospira*); and (3) a virus. The greatest single cause of death in wild and captive animals is lungworm. Animals in captivity have also died from pleuropneumonia, pneumonia, and enteric infections, diseases which may also occur in wild populations.

Ecological Problems.—Killer whales and large sharks are known to prey upon sea lions. California sea lions associated with certain hauling grounds and rookeries have practically abandoned these areas because of harassment by man. Although most major sea lion populations are now located on sites not easily reached by the public, a few areas, such as the Monterey Bay breakwater in Monterey, California, are used extensively as hauling grounds by California sea lions and are visited frequently by tour boats. The latter sometimes pass within 10 meters of the hauling ground.

Allocation Problems.—A history of conflict exists between people for and against complete protection of this species. Some conservation groups would like complete protection for the California sea lion while some fishermen want the number of California sea lions to be controlled. California sea lions are probably the most widely sought-after species of eared seals in the world for public display.

Current Research.—The National Marine Fisheries Service conducts research on this species on San Miguel Island off California. The following organizations are conducting research on the California sea lion: University of California, Santa Cruz, California; University of California, Berkeley, California; California Academy of Science, San Francisco, California; Humboldt State College, Arcata, California; and Fisheries Research Board of Canada, Nanaimo; Naval Undersea Center, San Diego, California; Navy Biomedical Research Laboratory, Oakland, California.

REFERENCES

- Banfield, A. W. F. 1974. The Mammals of Canada. Univ. Toronto Press, 438 pp.
- Bigg, Michael A. 1973. Census of California sea lions on southern Vancouver Island, British Columbia. J. Mammal. 54:285-287.
- Bonnot, P. 1951. The sea lions, seals, and sea otters of the California coast. Calif. Fish Game, 37:371-389.
- Brownell, Robert L., Jr., R. L. DeLong, and R. W. Schreiber. 1974. Pinniped populations at Islas de Guadalupe, San Benito, Cedros, and Navidad, Baja, California, in 1968. Jour. Mammal., 55(2):469-472.
- California Department of Fish and Game. 1971. California's living marine resources and their utilization. Herbert W. Frey (ed.). Calif. Dept. Fish Game, 148 p.
- Carlisle, J. G., and J. A. Aplin. 1966. Sea lions census for 1965 including counts of other California pinnipeds. Calif. Fish Game, 52:119-120.
- . 1971. Sea lion census for 1970, including counts of other California pinnipeds. Calif. Fish Game, 57:124-126.
- Daugherty, Anita E. 1972. Marine mammals of California, 2d rev. Calif. Dept. Fish Game, Sacramento, 90 p.
- DeLong, R. L., W. G. Gilmartin, and J. G. Simmon. 1973. Environmental pollutant residues in parturient California sea lions: premature vs normal. Science, Vol. 181, p. 1168-1170.
- Gilmartin, W. G., R. L. DeLong, A. W. Smith, J. C. Sweeney, B. W. deLappa, R. W. Risebrough, L. A. Griner, M. D. Dailey, and D. E. Peakall. Premature Pupping in the California Sea Lion. J. Wildl. Disease, 12(1).
- LeBoeuf, B. J., and M. L. Bonnell. 1971. DDT in California sea lions. Nature 234:108-110.
- Mate, Bruce R. 1975. Annual migrations of the sea lions *Eumetopias jubatus* and *Zalophus californianus* along the Oregon coast. In K. Ronald and A. W. Mansfield (eds.), Biology of the seal. Rapports et Proces-Verbaux, 169.
- Odell, D. K. 1971. Censuses of pinniped breeding on the California Channel Islands. J. Mammal. 52:187-190.
- . 1972. Studies on the biology of the California sea lion and the northern elephant seal on San Nicolas Island, California. Ph.D. thesis, Univ. Calif., Los Angeles, 168 p.
- Orr, R. T., J. Schoenwald, and K. W. Kenyon. 1970. The California sea lion: skull growth and a comparison of two populations. Proc. Calif. Acad. Sci., 4th Series, 37(11):380-394.
- Peterson, R. S., and G. A. Bartholomew. 1967. The natural history and behavior of the California sea lion. Amer. Soc. Mammal. Spec. Publ. No. 1, 79 p.
- Peterson, R. S., and B. J. LeBoeuf. 1969. Population studies of seals and sea lions. Trans. 34th N. Amer. Wildl. Nat. Res. Conf., p. 74-79.
- Rice, D. W., K. W. Kenyon and D. L. Luch-B. 1935. Pinniped populations at Islas Guadalupe, San Benito, and Cedros, Baja California in 1935. Trans. San Diego Soc. Nat. His. 14(7):73-84.
- Rirley, W. E., K. W. Cox, and J. L. Baxter. 1932. California sea lion census for 1958, 1960, and 1961. Calif. Fish Game, 48:228-231.
- NORTHERN (STELLER) SEA LION
(*Eumetopias jubatus*)
- Distribution and Migration.**—The northern sea lion is found in continental shelf water from the Sea of Japan and northern Honshu, Japan, northward around the North Pacific Ocean rim to the Okhotsk and Bering Seas and southward to the California Channel Islands. Some seasonal movements occur in parts of its range. Examples of such movements are differences in the winter and summer distribution of these animals in the Bering Sea, and the post-breeding movements in central California.
- Abundance and Trends.**—Kenyon and Rice (1961) estimated the world population at between 240,000 and 300,000 in 1961. No published estimates of the total population have been made since that time. Alaska has 202 known rookeries and hauling grounds. The Alaskan population has increased considerably since the early 1900's and now exceeds 200,000 and may be near maximum levels in many areas (Alaska Department of Fish and Game, 1973). Since 1964, several thousand pups have been harvested annually in Alaska until 1973 when the Marine Mammal Protection Act became effective; 6,546 were taken in 1972.
- There has been a continuing control program on the British Columbia coast for many years. As early as 1917, 8,000 sea lions were destroyed by professional hunters.
- The population of sea lions in British Columbia waters was estimated at 11,000 to 12,000 from an aerial census in 1956-57. The authorities undertook a heavy reduction program in 1959 and 1960, and the population was reduced to about 4,000 animals in 1969 (Banfield, 1974).
- Kenyon and Scheffer (1962) made six aerial and one surface survey along the Washington coast between 1949 and 1959 and stated that the population did not exceed 500. Pearson and Verts (1970) estimated the Oregon population at 1,078. Mate (pers. comm., 1975) estimated the Oregon breeding population to number approximately 2,000 animals. The California Department of Fish and Game makes periodic aerial censuses of sea lions in California. Carlisle and Aplin (1971) have given the following figures for sea lions in California north of Pt. Conception: (1958) 7,053; (1961) 6,675; (1965) 4,998; (1969) 7,156; and (1970) 5,189. They consider these to be northern sea lions, although small numbers of California sea lions were known to occur north of Pt. Conception at the time the census was made.
- The northern sea lion ranges to the Channel Islands group south of Pt. Conception. In the Channel Islands, the population peaked at about 2,000 in the late 1930's and has declined since (Bartholomew, 1967). In 1975, the San Miguel Island population was estimated by DeLong (pers. comm.) at 30 to 35 plus a few pups.
- General Biology:**
- Species Statistics.**—The adult males grow to 3.0 m in length and over 900 kg in weight. The adult females reach 2.0 m and almost 300 kg. Newborn pups weigh 16-23 kg, are 89-102 cm long, and have a dark chocolate-colored pelage.
- Reproductive Data.**—Northern sea lions favor isolated locations with some shelter, free access to the sea, and freedom from human harassment. Colonies may become established on rock outcrops and boulder, cobblestone, and coarse sand beaches.
- Males may mature sexually by age 5 years, but hold breeding territories first at age 7 or 8. Females can first produce young at age 5 or 6, and breed 10-14 days after parturition. The adult male maintains a territory 40 to 60 days and fasts throughout the period. The harems consist of 10-30 cows. The female is aggressive toward other females for several days after her pup is born.
- Age-Growth Data.**—The pup sheds its dark chocolate birthcoat for the tan pelage in the autumn of birth. Some pups remain with their mothers the first year. They have been known to live 17 years in the wild.
- The northern sea lion has only a few predators besides man—the killer whale and one or two species of large sharks.
- Feeding Habits.**—The northern sea lion feeds on a variety of fish and cephalopods. A study of 382 stomachs indicated the following diet: squid, octopus, sand lance, rockfish, clams, crabs, flounder, halibut, greenling, and lumpfish.
- Ecological Problems.**—Northern sea lions in some areas may compete with other pinnipeds for rookery and hauling ground space. Excessive disturbance by humans of sea lions on their rookeries and hauling grounds has caused the animals to abandon these areas.
- Allocation Problems.**—Northern sea lions have damaged gear and destroyed fish in the halibut longline, salmon purse seine, gillnet, and troll fisheries. In recent months, the Alaska Department of Fish and Game has received increasing numbers of gear damage complaints from fishermen with respect to the northern sea lion (J. Vania, pers. comm., 1974). The species has also destroyed herring in herring pots and has been accused of biting and sinking inflated plastic buoys used to mark crab pots. This species has considerable esthetic and recreational value.

Current Research.—This species has its center of abundance in Alaska where the Alaska Department of Fish and Game's management and research investigations have been directed primarily at determining abundance and distribution, and the effects of harvesting operations on rookery populations. A marking program began in 1975, and an aerial survey program in 1976. The University of California, Santa Cruz, is also conducting research on the species off California.

REFERENCES

- Alaska Department of Fish and Game. 1973. Alaska's wildlife and habitat. Van Cleve Printing, Anchorage, 143 p.
- Banfield, A. W. F. 1974. The Mammals of Canada. University of Toronto Press, 438 pp.
- Bartholomew, G. A. 1967. Seal and sea lion populations of the California islands. P. 229-244 In Philbrick, R. N. (ed.), Proc. Symp. on the biology of the California Islands. Santa Barbara Botanic Garden.
- Bonnot, Paul. 1929. Report on the seals and sea lions of California, 1928. Calif. Fish Game, Fish Bull. 14, 62 pp.
- Carlisle, John G., and J. A. Applin. 1971. Sea lion census for 1970, including counts of other California pinnipeds. Calif. Fish Game, 57(2):124-126.
- Fiscus, C. H., and G. A. Baines. 1966. Food and feeding behavior of Steller and California sea lions. J. Mammal. 47:195-200.
- Gentry, R. L. 1968. Censuses of Steller sea lions Ano Nuevo Island during 1967-1968. P. 23-25 In Peterson, R. L. (ed.) Ano Nuevo Reports, 2. Univ. of Calif., Santa Cruz.
- Gentry, R. L. 1970. Social behavior of the Steller sea lion. Ph.D. thesis, Univ. Calif., Santa Cruz, 113 p.
- Kenyon, K. W., and D. W. Rice. 1961. Abundance and distribution of the Steller sea lion. J. Mammal. 43:223-234.
- Kenyon, K. W., and V. B. Scheffer. 1962. Wildlife surveys along the northwest coast of Washington. Murrelet, 42:1-9.
- Mate, B. R. 1973. Population kinetics and related ecology of pinnipeds along the Oregon coast. Ph.D. thesis, Univ. Oreg. Eugene, 92 p.
- 1975. Annual migrations of the sea lions *Eumetopias jubatus* and *Zalophus californicus* along the Oregon coast. K. Ronald and A. W. Mansfield (eds.), Biology of the Seal. Rapports et Proces-Verbaux, 169.
- Mathisen, O. A., R. T. Baade, and R. J. Lopp. 1962. Breeding habits, growth and stomach contents of the Steller sea lion in Alaska. J. Mammal. 43:469-477.
- Nishiwaki, M., and F. Nagasaki. 1960. Seals of the Japanese coastal waters. Mammalia, 24:459-467.
- Orr, R. T., and T. C. Poulter. 1965. The pinniped population of Ano Nuevo Island, California. Proc. Calif. Acad. Sci. 32:377-404.
- Pearson, J. P., and B. J. Verts. 1970. Abundance and distribution of harbor seals and northern sea lions in Oregon. Murrelet, 51:1-5.
- Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. Fish. Res. Bd. Can. Bull. 171, 54 p.
- Sandgren, F. E. 1970. Breeding and maternal behavior of the Steller sea lion (*Eumetopias jubatus*) in Alaska. MS thesis, Univ. Alaska, Fairbanks, 138 p.
- Smith, I. D. 1972. Sea lions wintering along the outer coast of Vancouver Island. J. Fish. Res. Bd. Can. 29:1764-1768.
- Spaulding, D. J. 1964. Comparative feeding habits of the fur seal, sea lion, and harbor seal on the British Columbia coast. Fish. Res. Bd. Can. Bull. 146, 52 p.

SOUTH AMERICAN FUR SEAL (*Arctocephalus australis*)

Distribution and Migration.—Two major populations of the South American fur seal, identifiable only by size, are found, one on the Falkland Islands (Islas Malvinas) and the other on coastal Uruguayan Islands. Minor populations of this species occur in Argentina, Chile, and Peru. The adults are on the Uruguayan breeding grounds in November and December, and offshore up to 200 miles east on the edge of the continental platform during the austral winter. An extreme northern record for the South American fur seal was of one identified at Rio de Janeiro, Brazil.

Abundance and Trends.—In 1972, the Uruguayan population was estimated at 252,000. This population grew from an estimated 129,000 in 1960 to an estimated 174,000 in 1965. Other populations are also increasing. Information on abundance and trends was furnished by Isaiás Ximénez, Uruguayan Government biologist.

General Biology:

Species Statistics.—Adult males on the Falkland Islands grow to 159 kg, whereas those in Uruguay reach only 136 kg; the females weight 33-48 kg. The males are blackish-gray, the females and immature animals vary but usually have a silvery-gray neck and back and a yellow tint to the belly.

Reproductive Data.—Males are polygynous and establish territories in early November. Most of the pregnant females arrive on the rookeries in mid-November, and form small harems of about six animals. Within 6-7 days, each female bears a single pup and breeds 2-3 days later. Most males breed at age 7 years and the females at age 3 years. Uterine implantation of the blastocyst probably occurs in March. Gestation, including the period of delayed implantation, lasts nearly one year.

Age-Growth Data.—Most of the animals leave the rookeries during the austral winter. On the rookeries, the fur seals are in close contact with South American sea lions, *Otaria flavescens*. Main causes of death in order of importance are from sporadic storms, which wash large numbers of pups out to sea; the seven-gilled shark; and probably the killer whale, which is common around the larger rookeries.

Feeding Habits.—Investigation of stomach contents has revealed little except stones, but the seals are believed to eat fish and crustaceans, and probably cephalopods.

Parasites and Diseases.—The South American fur seal has nasal mites and 10 species of endoparasites, but no heart or lung worms.

Ecological Problems.—Offshore oil wells are planned in the near future which may result in an ecological hazard.

Allocation Problems.—The species has esthetic, educational, and economic values. The Government of Uruguay annually harvests about 12,000 male fur seals on the islands.

Current Research.—Long-term research on this species is carried out by the Governments of Uruguay and Argentina. In addition, short-term projects are carried out by the National History Museum of Montevideo and the Smithsonian Institution.

REFERENCES

- Peso Blanco, J. del. 1911. Pocos de la Republica o del Uruguay. Granada, Spain, 27 p.
- Perez-Fontana, H. 1943. Informe sobre la industria lobera (Ciento diez años de explotación de la industria lobera en nuestros paises). Informe sobre la industria pesquera nacional, 1943, publicado por el Servicio Oceanografico y de Pesca.
- Smith, Hugh M. 1927. The Uruguayan fur seal islands. Zoologica 9(5):271-294.
- Vaz Ferreira, Raul. 1950. Observaciones sobre la Isla de Lobos. Revista de la Facultad de Humanidades y Ciencias, Montevideo, Uruguay, 5:145-176.
- 1956. Etologia terrestre de *Arctocephalus australis* (Zimmermann) ("lobo fino") en las Islas Uruguayas. Servicio Oceanografico de Pesca, Trabajos sobre de Lobos lobos marinos, 2:1-22.
- Vaz Ferreira Raul, and Blanca Sierra de Soriano. 1961. Division funcional del habite terrestre y estructura de las agregaciones sociales de *Arctocephalus australis* (Zimmerman), estudio grafico. Rev. Fac. Hum. Cienc. 19:253-260.
- Ximenez, Isaias. 1963. Frecuencia y fluctuaciones estacionales en la poblacion de *Arctocephalus australis* en algunas zonas de la Isla de Lobos. Rev. Inst. Invest. Pesq. 1(2):141-158.
- 1973. Nota preliminar sobre la repoblacion de *Arctocephalus australis* en la Isla Rasa. Trab. V Congr. Latinoam. Zool. Montevideo, 1:281-288.

SOUTH AFRICAN (CAPE) FUR SEAL

(*Arctocephalus pusillus*)

Distribution and Migration.—The South African fur seal breeds on the mainland and coastal islands of southern Africa from Cape Cross (South West Africa) to Algoa Bay (South Africa). This species shows no definite seasonal migration, but disperses widely while feeding. A marked adult was seen in deep-sea trawling grounds 450 miles from its birthplace. Young seals in their first year (November to October) frequent protected bays and areas near their places of birth.

Abundance and Trends.—Rand (1972b) estimates about 19,500 mature territorial males and about 273,000 mature females on mainland and island rookeries of the Republic of South Africa. Best (1973) estimates that from 250,000 to 300,000 South African fur seal pups are born each year in the Republic of South Africa and South West Africa. Shaughnessy (1975) has reviewed the estimates of Best (1973) and revised them downward to between 211,000 and 213,000 pups. First year pups (about 9 months) and a small (unknown) number of second-year animals of either sex are harvested in the winter (June-September), although all cow seals are protected (op. cit.). In 1950, the winter harvest totaled 27,289 pups and has increased to 76,694 in 1971 (Laws, 1973). The summer kill of surplus adult males (October-December) has declined from 3,000 in

the early 1950's to 812 in 1969 (Rand, 1972b).

General Biology:

Species Statistics.—The adult males weigh 204.2–317.6 kg and grow to 2.3 m long; females weigh 90.7–122.0 kg and are 1.5–1.8 m long. At birth the pup is about 0.76 m long and averages 6.4 kg.

Reproductive Data.—In late October, when most of the older pups are weaned, the first adult males come ashore to establish territories and harems; pregnant females arrive about a week later. In November and early December, the female bears a single pup (twins are rare), mates 5–6 days later, then leaves its pup for the first time and feeds for 1–2 days at sea. Subsequent nursing-feeding cycles extend to 4–5 days on land and 7–10 days at sea. Implantation of the blastocyst in the uterus is delayed until April or May. Thus, gestation is 7–8 months, but may be longer for some females that mate for the first time in their second year.

Age-Growth Data.—Adults of both sexes molt on land (14 days duration) a few weeks after the breeding season, usually during March. The pups also shed their natal hair and milk teeth at this time and acquire the olive-gray coat of the yearling. The copper-colored underfur also becomes obvious.

Weaning is well advanced by September and October, although undisturbed mother-pup relationships may prolong weaning.

Feeding Habits.—Food consists of fish, cephalopods, and various small crustaceans.

Ecological Problems.—Sharks and killer whales are natural predators.

Allocation Problems.—Local fishermen engage in scattered and illegal killing of seals, contending that the animals interfere with their expanding purse-seine fishery. Seals occasionally feed on fish protruding through the meshes of otter trawl nets or taken by line fisheries.

Current Research.—A recently expanded research program is carried out by the South African government to measure herd size, production, annual recruitment, natural and harvest mortality, and movements.

REFERENCES

- Best, Peter B. 1973. Seals and sealing in South Africa and South West Africa. 14 processed pp. plus appendix. Statement at the application of the Fouke Company for exemption from the Marine Mammal Protection Act.
- Franca, Pedro da. 1967. Sur la Presence d'*Arctocephalus pusillus* (Schreber) (Otaridae) et de *Mirounga leonina* (Linne) (Phocidae) au sud de l'Angola. *Mammalia* 31(1):50–54.
- King, Judith E. 1964. Seals of the world. *Brit. Mus. (Nat. Hist.)*, London, 154 p.
- Laws, R. M. 1973. The current status of seals in the Southern Hemisphere. IUCN. New Pub. Ser., Supple. Pap. No. 39:144–161.
- Rand, R. W. 1955. Reproduction in the female Cape fur seal, *Arctocephalus pusillus* (Schreber). *Proc. Zool. Soc. London*, 124: 717–740.
- 1956. The Cape fur seal (*Arctocephalus pusillus*). Its general characteristics and moult. *Investigational Report. Division of Fisheries, South Africa* 21:1–52.

— 1959. The Cape fur seal (*Arctocephalus pusillus*). Distribution, abundance and feeding habits off the southwestern coast of the Cape Province. *Div. Sea Fish. Invest. Rep.* 34, p. 1–75.

— 1967. The Cape fur seal (*Arctocephalus pusillus*). 3. General behaviour on land and at sea. *Div. Sea Fish. Invest. Rep.* 60, 39 p.

— 1972a. Conservation of Cape fur-seals. Text of a lecture delivered to Wildlife Society, Transvaal Branch, 7 Nov. 1972 at Johannesburg.

— 1972b. The Cape fur seal (*Arctocephalus pusillus*). 4. Estimates of population size. *Div. Sea Fish. Invest. Rep.* 89, 28p.

Rand, Robert W. 1973. Management of the South African fur seals. *Jour. South African Wildl. Management Assoc.*, 3(2): 85–87.

Shaughnessy, P. D. 1975. The status of seals in South Africa and South West Africa. Report to Working Group III, Advisory Committee on Marine Resource Research, Food and Agriculture Organization of the United Nations. Seattle, Washington, Sept. 1–6, 63 p. processed.

Visser, John. 1967. Catching South African fur seals. *Zoonecos*, 40(2) 15–19.

JUAN FERNANDEZ FUR SEAL

(*Arctocephalus philippi*)

Distribution and Migration.—This seal occurs on islands of the Islas Juan Fernandez (360 and 440 miles west of Valparaiso, Chile) and Islas San Felix (500 miles west of Caldera, Chile). The two groups are 500 miles apart. It is not known elsewhere, and migratory movements are unknown.

Abundance and Trends.—In the late 18th and early 19th centuries the population may have numbered 3 to 3½ million but was reduced to the point of commercial extinction. Although occasional reports of its existence occurred, the species had been regarded as probably extinct since the early 19th century. In 1965 its existence was confirmed (Aguayo 1971). Aguayo (1973) estimates 7 to 8 hundred seals now occur in the Islas Juan Fernandez. The trend in numbers is increasing.

General Biology.—The biology of this species is little known. Field specimens have been taken and no studies made. Presently known to breed only on the Islas Juan Fernandez. Pupping occurs in December. The Juan Fernandez Seal has a similar habitat to that utilized by the Guadalupe Seal.

Species Statistics.—In comparing skull size, this species is second in size to *A. pusillus*. One specimen (male), taken in November 1968, measured 200.6 cm in length, weighed as estimated 159 kg and the condylobasal length 150 cm in length, no weight was given, and the condylobasal length of the skull was 227 mm. In the Guadalupe fur seal (*A. townsendi*), long considered a subspecies of *A. philippi* the male measures about 180 cm in length and weighs about 136 kg. In the South American fur seal (*A. australis*), males reach a maximum length of 188.5 cm, females 142.5 cm and a weight of 159 kg in males and 48.5 kg in females.

Reproductive Data.—No study has been made.

Age Growth Data.—No study has been made.

Ecological Problems.—None known.

Allocation Problems.—Although the species has been given complete protection by Chilean law since 1965, local fishermen may still kill some seals to bait lobster traps.

Current Research.—None known.

REFERENCES

- Aguayo, L. A. 1971. The present status of the Juan Fernandez fur seal. *K. Norske Vidensk. Selsk. Skr.* 1: 1–4. Figs. 1–2.
- Aguayo, L. A. 1973. The Juan Fernandez fur seal. In *Seals, Proceedings of a working meeting of seal specialists on threatened and depleted seals of the world held under the auspices of the Survival Services Commission of IUNCH*, pp. 140–143.
- Hubbs, C. L., and K. S. Norris. 1971. Original teeming abundance, supposed extinction and survival of the Juan Fernandez Fur Seal. *Antarctic Res. Ser.* 18: 35–52.
- Repenning, C. A., R. S. Peterson, and C. L. Hubbs. 1971. Contribution to the systematics of the southern fur seals, with particular reference to the Juan Fernandez and Guadalupe species. *Antarctic Pinnipedia, Antarctic Res. Ser.* 18: 1–31.
- Rice, D. W. 1978. A list of Marine Mammals of the World (third edition). *Special Scientific Report Fisheries* (in press).

GUADALUPE FUR SEAL

(*Arctocephalus townsendi*)

Distribution and Migration.—The distribution of *A. townsendi* in the 18th and 19th centuries is unknown. The Guadalupe fur seal was believed extinct during two periods (1895–1926; 1928–49). One adult male was observed on San Nicolas Island in 1949, and breeding animals were rediscovered at Guadalupe Island in 1954. Subsequently, individual animals have been reported at Cedros Island, Baja California, and adult and immature males have been sighted on San Miguel Island each year since 1968.

Abundance and Trends.—The last Guadalupe fur seal was commercially harvested from the islands of southern California and Baja California in 1894. The populations of Guadalupe fur seals on the Guadalupe and San Benito Islands apparently once numbered in the thousands. Rice, et al. (1965) counted 285 of these mammals on Guadalupe Island and suggested that the population was growing rapidly and may contain as many as 600 animals, including those in the water. Peterson, et al. (1968) counted 372 animals in April 1966. In June 1968, 314 individuals including pups were observed on Isla de Guadalupe. (Brownell, et al., 1974).

General Biology.—Biological information on this species is scarce. Specimens have not been collected since their recent rediscovery.

Species Statistics.—The males are almost 1.8 m long and weigh about 136 kg. Males appear somewhat smaller and females considerably larger than *Californianus ursinus*. *A. townsendi* can be separated from *C. ursinus* by its narrow, pointed muzzle and the extension of pelage beyond the wrist onto the dorsum of the foreflipper. It is separated from *Zalophus californianus* by its distinctive underfur.

Reproductive Data.—The pups are born in May, June, July. Although breeding has not been observed, a postpartum estrus probably occurs, which would extend the breeding period into August. The adult males establish territories in isolated caves or recesses that have access to the sea or among large boulders close to the splash zone. Single or small groups of breeding territories are distributed along 20 km of the eastern shoreline of Guadalupe Island. The harems contain 1-10 females.

Age-Growth Data.—The adult males apparently spend considerable time at sea; most sightings of males on other islands have occurred during the non-breeding season, but since 1973 males have been observed at San Miguel Island during the breeding season. The females may not migrate long distances from Guadalupe Island.

Ecological Problems.—Increasing numbers of human visitors to Guadalupe Island are subjecting the animals to more disturbance. Because they breed only on Guadalupe Island, the seals need complete protection from undue disturbance and habitat modification.

Allocation Problems.—None known.

Current Research.—The University of California makes periodic censuses of this species. In 1976, the University of Washington and NMFS, Marine Mammal Division, will begin a study of the species.

REFERENCES

- Brownell, Robert L. Jr., R. L. DeLong, and R. W. Schreiber. 1974. Pinniped populations at Islas de Guadalupe, San Benito, Cedros, and Natividad, Baja California, in 1968. *Journal Mammalogy*, 55(2): 469-472.
- Hubbs, Carl L. 1958. Back from oblivion: Guadalupe fur seal: still a living species. *Pac. Disc.* 9(6): 14-21.
- Peterson, R. S., C. L. Hubbs, R. L. Gentry, and R. L. DeLong. 1968. The Guadalupe fur seal: habitat, behavior, population size, and field identification. *J. Mammal.* 49: 666-675.
- Peterson, R. S., and Donald H. Ramsey. 1969. Reproductive behavior of the Guadalupe fur seal. *Proc. Biol. Soc. and Diving Mammal Conf., Stanford Res. Inst.*, p. 35-42.
- Repenning, Charles A., R. S. Peterson, and C. L. Hubbs. 1971. Contributions to the systematics of the southern fur seal with particular reference to the Juan Fernandez and Guadalupe species. *Antarctic Pinnipedia*, Antarctic Res. Ser. 18: 1-34.
- Rice, D. W., K. W. Kenyon, and D. L. Luch-B. 1965. Pinniped populations at Islas Guadalupe, San Benito, and Cedros, Baja California, in 1965. *Trans. San Diego Soc. Nat. Hist.* 14(7): 73-81.
- Scheffer, V. B. 1958. Seals, sea lions, and walrus: a review of the Pinnipedia. Stanford Univ. Press, 179 p. plus 32 pls.

NORTHERN FUR SEAL

(*Callorhinus ursinus*)

Distribution and Migration.—Most of the animals are on their breeding grounds from May through November to bear young and to breed. They otherwise are found at sea along the continental shelf from the Bering Sea south along both sides of the North Pacific Ocean to latitude 32°N. Some intermingling of eastern and western Pacific popula-

tions occurs at sea and on land, primarily among males younger than age 6 years.

Abundance and Trends.—A program of reducing the population of Pribilof Islands fur seals was begun in 1958 with the expectation that the rate of survival would improve (Roppel, et al., 1963) and result in an increased yield of pelts. By 1968, it had become evident that the herd had been reduced to a level somewhat below that of maximum sustainable yield, and that an increase in the number of pups born was desirable. Thus female fur seals have not been harvested commercially on the Pribilof Islands since 1968 with the expectation that the population would increase. However, less than average survival of several year classes, the cause of which is not understood, has prevented the expected increase. In 1975 the number of pups born was estimated to be 362,000 and in the past the maximum yield of furs was produced when about 400,000 pups were born.

Apparently the Commander Islands fur seals have not become reestablished on a considerable portion of their original rookery area. Consequently, this population should increase to a higher level. It is likely that the Robben Island population is near the maximum. Johnson (1972) estimated the abundance of northern fur seals by breeding islands, as follows:

ESTIMATED NUMBER OF NORTHERN FUR SEALS

Location of fur seal rookeries:	Thousands
Pribilof Islands	1,300
San Miguel Island	2
Commander Islands	265
Robben Island	165
Kuril Islands	33
Total	1,765

General Biology:

Species Statistics.—The adult male weighs 227-318 kg, and the female 36-59 kg., newborn pups averaged 4.5 (female) and 5.4 kg (male). The male is polygynous and establishes his territory in late May and early June.

Reproductive Data.—Most of the pregnant females arrive on the rookeries in late June and early July, when they form harems of 1-100 females to one adult male. Within 3 days of her arrival, the female bears a single pup (twins are rare), breeds 2 to 5 days later, then begins nursing-feeding cycles of 2 days on land and about 8 days at sea within a 200-mile radius. Implantation of the blastocyst is delayed until November. Most of the males first breed at age 10, and few live longer than 15 years.

General Behavior.—Immature fur seals arrive on the breeding grounds in descending order of age, the males beginning in mid-June and the females in late July. Some 1-year-olds haul out in September and October, but most fur seals return first at age 2. Most of the animals have left the rookeries by De-

cember. The adult males winter in northern waters, pregnant females usually migrate as far south as southern California and young animals of both sexes are found throughout that range.

Diseases and Parasites.—The main causes of death among pups on the rookeries are, in order of importance: emaciation-malnutrition syndrome, hookworm disease, bacterial infections, leptospirosis (perinatal hemorrhagic syndrome), an injuries. Pathogenic bacteria thus far isolated include: *Clostridium perfringens*, *Proteus mirabilis*, *Salmonella enteritidis*, and *Leptospira* sp. A psittacosis group chlamydia has been reported, but the clinical syndrome caused by the agent has not been described. A calicivirus, indistinguishable from Vesicular Exanthema of Swine virus has been found associated with vesicles on the flipper and may be related to emaciation syndrome.

The fur seal has filarial worms, stomach ascarids, intestinal flukes, cestodes hookworms, and acanthocephalans, and nasal mites, but no heart or lungworms. Hookworms and sucking lice parasitize the newborn.

Ecological Problems.—Northern fur seals concentrate within their body tissues contaminants such as pesticides and heavy metals. For example, mercury compounds have been found in fur seal liver, large quantities of which have been eaten by residents of the Pribilof Islands. No evidence exists that consumption of fur seal liver has been a health hazard, but following the discovery of mercury in this organ, little liver has been eaten by the people. The effect of contaminants on the health of fur seals is unknown.

Allocation Problems.—In the North Pacific Ocean and Bering Sea, fur seals and commercial fisheries may be in competition for the same species of fish. Harvesting of fur seals on the Pribilof Islands has been criticized in recent years by animal protection organizations that would prefer esthetic and educational rather than economic use of the resource.

Current Research.—Long-term research is financed and carried out by the Governments of Japan, Canada, the U.S.S.R., and the United States. Short-term projects are frequently carried out on the Pribilof Islands by university professors or graduate students.

In 1973 St. George Island was designated by the North Pacific Fur Seal Commission as an area of intensive research where no commercial harvest would take place for some period of years. An expanded research program on St. George Island was begun in 1973.

REFERENCES

- Anas, R. 1970. Mercury found in fur seals. *Comm. Fish. Rev.* 32(12): 3.
- Anas, R. E., and A. J. Wilson, Jr. 1970. Organochlorine pesticides in nursing fur seal pups. *Pest. Monit. J.* 4(3): 114-115.
- Chapman, D. G. 1964. A critical study of Pribilof fur seal population estimates. *U.S. Fish Wildl. Serv., Fish. Bul.* 63(3): 657-669.
- Johnson, A. M. In Press. The status of northern fur seal populations. In Symposium on the Biology of the Seal, Guelph, Ontario. August 14-17, 1972.

¹ An average of 48,000 males were available annually for harvest in 1956-72, while the average was 65,000 annually from 1939-55.

- Kenyon, K. W., V. B. Scheffer, and D. G. Chapman. 1954. A population study of the Alaska fur seal herd. U.S. Fish Wildl. Serv., Spec. Sci. Rep. Wildl. 12, 77 p.
- Keyes, M. C. 1965. Pathology of the northern fur seal. J. Amer. Vet. Med. Ass. 147(10): 1090-1095.
- Lander, R.H. and H. Kajimura. 1975. Status of northern fur seals. FAO working party of Advisory Committee on Marine Resource Research (Group III—Seals and marine otters). Seattle, Washington, 1975, processed report.
- North Pacific Fur Seal Commission. 1965. North Pacific Fur Seal Commission Report on Investigations from 1958 to 1961. Kenkyusha Co., Tokyo, 183 p.
- 1969. North Pacific Fur Seal Commission Report on Investigations from 1964 to 1966. Kenkyusha Co., Tokyo, 161 p.
- Roppel, A. Y., A. M. Johnson, R. D. Bauer, D. G. Chapman, and F. Wilke. 1963. Fur seal investigations. Pribilof Islands, Alaska. U.S. Fish. Wildl. Serv., Spec. Sci. Rep. Fish. 454, 6 + 101 p.

HARBOR SEAL (*Phoca vitulina*)

Distribution and Migration.—The harbor seal is found in the North Atlantic Ocean from the ice pack south to France and Georgia and in the North Pacific Ocean waters from the Arctic Ocean south to Baja California and southern Japan and Korea. Populations that breed on the ice in the Bering and Okhotsk Seas are distinct from those that breed on land. *P. v. largha*, the ice-inhabiting form, lives in the seasonal pack ice in winter and spring, bearing and nurturing its pup there, and moves toward the coasts when the ice retreats. The coastal forms (*P. v. richardi* and *P. v. kurilenensis* in the North Pacific; *P. v. vitulina* and *P. v. concolor* in the North Atlantic) are more sedentary. The harbor seal is the predominant nearshore seal in ice-free waters north of 35°N latitude.

Abundance and Trends.—Overall, the world population of harbor seals appears to be high and stable. About 750,000 are present in the North Pacific area (Alaska Department of Fish and Game, 1973; Bigg, 1969; Chapkii, 1966) and about 150,000 in the European North Atlantic region (Chanskii, 1966).

General Biology:

Species Statistics.—Harbor seals of all subspecies are of medium size; large adults of both sexes are from 160 to 180 cm long and weigh about 130 to 150 kg. Pups weigh from 9 to 12 kg, and are about 80 to 90 cm long at birth. Pups of ice-inhabiting harbor seals are born with white coats, whereas those of the coastal form possess dark coats. Coloration in the adults varies considerably; the background varies from creamy white to dark brown with irregular dark brown blotches.

Reproductive Data.—Adults of the ice-inhabiting form pair in March for the duration of the breeding season, and a single pup is born to each pair on the ice, usually in March or April. Adults of the coastal form congregate on islets and also bear a single pup, usually in April to July. The pups of each form nurse 4 to 6 weeks, in which time the weight is more than doubled. Males of

both forms become sexually mature at 4 to 5 years of age; females at 3 or 4 years. Breeding is annual, and the period of pregnancy (including delayed implantation) is about 10.5 months.

Age-Growth Data.—Adults of both forms are gregarious outside the breeding season. The annual molt occurs between August and early November; it proceeds from the posterior to the anterior parts. Predators include the sharks. Golden eagles have been known to prey upon newborn pups resting on sandbars.

Feeding Habits.—The diet of the harbor seal, which varies according to season and location of specific populations, includes primarily pelagic, demersal and anadromous fishes, cephalopods, and crustaceans. In captivity a single animal eats about 4 kg of fish per day.

This species has been known to dive as deep as 91.5 m for short periods and can remain under water for as long as 23 minutes.

Parasites and Diseases.—Almost all adult seals have anisakid roundworms and corynosomid acanthocephalans, and occasionally, high infestations of anopluran lice. The latter seem associated with filarial heart worms and may be vectors. Toxoplasma has been reported in captive animals, but its presence in wild seals is not verified.

Ecological Problems.—In some parts of its range, the harbor seal contributes to high worm infections in fish, notably codfish. This animal is extremely sensitive to disturbance, and may leave an area temporarily or even permanently after continual harassment by people, equipment, or aircraft. Contamination of the environment with pesticides, heavy metals, and other contaminants may be a problem for the land-breeding harbor seal because it frequently inhabits the relatively closed waters of bays and estuaries where these contaminants are likely to concentrate.

Allocation Problems.—These seals damage commercial fishing gear and compete with man for such fish as herring, smelt, whitefish, and salmon.

According to the Alaska Department of Fish and Game, hunting and the harvest of the harbor seal have declined markedly during the past year because of a reduced market for salable products from these species, mainly skins. In southeastern Alaska, the decreased harvest has resulted in additional conflicts between the harbor seal and the fishermen.

Current Research.—Ongoing research in California, Washington, British Columbia, Alaska, the U.S.S.R., and Japan is aimed toward the identification of North Pacific populations and describing their distribution and movements, reproductive biology, feeding habits, growth, physiology and ecology.

REFERENCES

- Alaska Department of Fish and Game. 1972. Testimony presented to Senate Subcommittee on Oceans and Atmosphere. Nome, Alaska, May 11, 12, and 13, 1972. Serial No. 92-56, U.S. Gov. Print. Off., Wash., D.C.
- 1973. Marine Mammal status reports. Unpublished, Juneau, Alaska.
- Banfield, A. W. F. 1974. The mammals of Canada. Univ. Toronto Press, 438 pp.
- Bigg, M. A. 1969. The harbor seal in British Columbia. Fish. Res. Bd. Can., Bull. 172, 33 p.
- Bishop, R. H. 1967. Reproduction, age determination, and behavior of the harbor seal, *Phoca vitulina* L., in the Gulf of Alaska. MS thesis, Univ. Alaska, 121 p.
- Bonner, W. N. 1972. The grey seal and common seal in European waters. Oceanogr. Mar. Biol. Ann. Rev., 10: 461-507.
- Burns, J. J. 1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. J. Mammal. 51: 445-454.
- Burns, J. J., and F. H. Pay. 1972. Comparative biology of Bering Sea harbor seal populations. Paper presented at 23d Alaska Sci. Conf., Fairbanks AK, Aug. 1972.
- Bychkov, V. A. 1971. Pinnipeds of the U.S.S.R. P. 59-74 In Shaposhnikov, L. K. (ed.), Review of the status of U.S.S.R. Pinnipedia conservation. Min. Sel. Khoz. S.S.S.R., Tsent. Lab. Okhr. Priro. Moscow. Transl. IPST 650946.
- Chapskii, K. K. 1966. Sovremennoe sostoyanie i zadachi vosstanovleniya resursov morskogo zverobolnogo promysla (Present state and tasks of the restoration of resources of marine trapping). Tezisy 3-go Vses. Soveshch. po Izuch. Morsk. Mlek., Moskva-Leningrad, "Nauka."
- Galster, W., and J. Burns. 1972. Accumulation of pesticides in Alaskan marine mammals. Paper presented at 23d Alaska Sci. Conf., Fairbanks, AK, August, 1972.
- Mansfield, A. W. 1967. Distribution of the harbor seal, *Phoca vitulina* Linnaeus, in Canadian arctic waters. J. Mammal. 48:249-257.
- Naito, Y., and M. Nishiwaki. 1972. The growth of two species of the harbor seal in the adjacent waters of Hokkaido Sci. Rep. Whales Res. Inst., 24:127-145.
- Wilson, Susan. 1973. Mother-young interactions in the common seal *Phoca vitulina vitulina*. Behavior, 48 (1-2): 23-26.

RINGED SEAL

(*Pusa (=Phoca) hispida*)

Distribution and Migration.—The ringed seal is circumpolar in distribution in the ice pack. In the North Pacific Ocean it is found in the Bering, Chukchi, and Okhotsk Seas and in the permanent ice pack of the Polar Basin. In winter, most ringed seals occupy areas of land-fast ice, but nonbreeding adults and juveniles may be found wherever ice occurs. Apparently, animals wintering in the Bering and Chukchi Seas move northward in spring as the ice recedes and southward in autumn as it advances again, whereas those in the Canadian Arctic may reside year-round in the same locality. In western Alaska, the ringed seal is the dominant near-shore seal during months when sea ice is present and is replaced by the harbor seal during ice-free months. A small proportion of the population, mainly juveniles, remains in ice-free areas of the Bering Sea during summer.

Abundance and Trends.—Counts of ringed seals on land-fast ice along the northern coast of Alaska made in 1970 (Burns and Harbo, 1972) indicated that the density of resident animals varies from 5.36 per square mile in the Chukchi Sea between Point Lay and Wainwright,

to 1.06 per square mile in the Beaufort Sea between Oliktok and Flaxman Island. Overall, the population in the Bering and Chukchi Seas appears high and is probably stable. Estimates of population size made by the Soviets are difficult to evaluate because they recognize three subspecies with overlapping ranges. The Soviets estimate that the total population of *P. hispida* is 5 to 6 million (Chapskii, 1966); *P. h. hispida* (North Atlantic and Arctic Oceans) at 2,500,000; *P. h. krascheninikovi* (western Bering Sea) at 12,000; and *P. h. ochotensis* (Okhotsk Sea) at 800,000 to 1,000,000 animals (Fedoseev, 1969, from Bychkov, 1971). The Alaska Department of Fish and Game (1973) estimates the Bering-Chukchi Seas population at about 250,000 ringed seals. The U.S. harvest is presently limited to an aboriginal harvest of 9,000-13,000 animals. Soviet pelagic sealing is now prohibited in the Bering Sea, and limited to a quota of 18,000 pelagic and 7,000 shore in the Okhotsk Sea; harvest in the Bering and Chukchi areas is 2,000-3,000 animals annually.

General Biology:

Species Statistics.—The ringed seal is the smallest of the northern seals. The adults of both sexes grow to about 125 cm in length and 66 kg in weight. A few individuals, usually females, become much larger. The animals undergo marked seasonal changes in weight, being heaviest in mid- to late winter. New-born pups are 55-65 cm long, weigh about 4.0 kg, and bear white coats. Coloration of the adults is variable. Dorsally they may be brown to blueish-black in background with irregular creamy rings with dark centers. The ventral surface may be silvery white to creamy yellow with scattered black spots.

Reproductive Data.—Males become sexually mature at 6 to 8 years of age, females at 5 to 7 years. The ringed seal breeds annually, has a 10.5 month period of pregnancy (including delayed implantation) and is probably monogamous. The males are sexually active between mid-March and mid-May, but they do not collect harems. The females are monestrous, and the oestrous period is postpartum while the females are still lactating. The pups are born from March to about mid-May in a birth lair within an ice pressure ridge or under drifted snow. The females nurse their pups for a full 4 to 6 weeks. A longer nursing period in sheltered northern bays, where snow and ice remain longer, produces larger pups.

Age-Growth Data.—The weight of the pup triples during the nursing period. The annual molt occurs between mid-May and mid-July, but a few molting individuals have been noted as late as 1 September. Maximum longevity exceeds 35 years, but one individual (a male) was determined to be 43 years old from annuli on the dentine layers of its teeth.

Predators of adults include sharks, killer whales, and polar bears. Polar bears and arctic foxes prey upon new-born "whitecoats" in their natural dens,

and even the larger and more powerful gulls attack exposed young pups.

Feeding Habits.—Ringed seals tend to be solitary but congregate in areas favorable for feeding, along extensive tide cracks in land-fast ice, and during seasonal migrations. The diet of these seals varies considerably, depending on their location and water depth. Their diving potential appears to be a depth of 91.5 m and for as long as 20 minutes. In western Alaska, this seal feeds mainly on mysids, amphipods, euphausiids, shrimps, saffron cod, polar cod, and sculpin. These seals fast from April to late June or July during their reproductive and molting seasons.

Parasites and Diseases.—The mammals commonly have internal parasites, including round worms, acanthocephalans, and anopluran lice.

Ecological Problems.—None known.

Allocation Problems.—According to the Alaska Department of Fish and Game, hunting and the harvest of the ringed seal have declined markedly during the past year because of a reduced market for salable products from these species, mainly skins.

Current Research.—The State of Alaska monitors the Eskimo harvest and conducts some biological research in conjunction with other programs. Canada conducts research on the ringed seal.

REFERENCES

- Alaska Department of Fish and Game. 1973. Marine mammal status reports. Unpublished report, Juneau, AK.
- Burns, J. J. 1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. *J. Mammal.* 51:445-454.
- Burns, J. J., and S. J. Harbo, Jr. 1972. An aerial census of ringed seals, northern coast of Alaska. *Arctic*, 25:279-290.
- Bychkov, V. A. 1971. Pinnipeds of the USSR. P. 69-74. In Shaposhnikov, L. I. (ed.), Review of the status of the USSR Pinnipeds conservation. Min. Sel. Khoz. SSSR, Tsentr. Lab. Okhar. Priir, Moscow. Transl. IPST 650946.
- Chapskii, K. K. 1966. (Present state and tasks of the restoration of resources of marine trapping.) *Tezisy 3-Go Vsesoyuznogo Soveshchaniya po izucheniuyu morskikh mlekop. tayushchikh.* Moscow, "Nauka."
- Fay, F. H. 1973. The role of ice in the ecology of marine mammals of the Bering Sea. Paper presented at International Symposium for Bering Sea Study, 30 Jan.-4 Feb. 1972, Hokodate, Japan. (In press.)
- Johnson, M. L., C. H. Fiscus, B. T. Ostenson, and M. L. Barbour. 1968. Marine mammals. P. 877-924. In Willimovsky, N. J., and J. N. Wolfe (eds.), Environment of the Cape Thompson Region, Alaska. U.S. Atomic Energy Comm., Oak Ridge, Tenn.
- McLaren, I. A. 1958. The biology of the ringed seal (*Phoca hispida* Schreber) in the Eastern Canadian arctic. *Fish. Res. Bd. Can. Bull.* 118, 97 p.
- Popov, L. A. 1975. Status of Main Ice Forms of Seals inhabiting waters of the USSR and adjacent to the Country Marine Areas. Reporting of Working Group III, Advisory Committee on Marine Research, Food and Agriculture Organization, United Nations, Sept. 1975, Seattle, Washington.
- Smith, Thomas G. 1973. Population dynamics of the ringed seal in the Canadian eastern Arctic. *Fish. Res. Bd. Can. Bull.* 181, 55 pp.
- Tikhomirov, E. A. 1966. On the reproduct of the seals belonging to the family Phocidae in the North Pacific. *Zh. Zhur.* 45(2):275-281. (Transl. by Geo Tschukow-Roux, Auke Bay Biol. L. Juneau, AK.)

GRAY SEAL

(*Halichoerus grypus*)

Distribution and Migration.—The gray seal inhabits the North Atlantic Ocean with major populations in eastern Canada, Iceland, and northwestern Europe. Dispersion, particularly by pups, from the Canadian breeding colonies in late spring and summer presumably accounts for most of the gray seals seen scatter along the coast of Maine. The tendency for adults to disperse is far less, although they at times make pronounced local movements. One animal tagged in eastern Canada was recently taken off western Norway.

Abundance and Trends.—The world population is estimated at 50,000 to 60,000 animals, with about two-thirds of these animals in the British Isles (Bonner, 1972). Because the population estimates for 1956-71 fit a straight line projection reasonably well, it can be presumed that the population will continue to expand in this manner (Bonner and Hickling, 1974). Platt, Prime, and Whitlames (1974) state that the annual increase in the number of births indicates a similar trend in the total population in the Farne Islands. An estimated 5,000 gray seals inhabit Canadian waters. A small colony of 10-15 animals was recently discovered on Muskeget Island, Massachusetts.

General Biology:

Species Statistics.—Adult males may reach a total length of 300 cm and weigh 290 kg; females are smaller, up to 250 cm and have a weight of 249 kg. The average weight and length of the newborn pups are 13.6 kg and 0.9 m, respectively. The adult coat is gray with obscure black blotches on the flanks and back, with lighter underparts. The pups are born with a long white coat which they molt within 3-4 weeks old to assume a dark gray spotted juvenile coat.

Reproductive Data.—Sexual maturity is reported to be reached between 6 and 7 years of age for members of Canadian populations. In the Farne Islands, bulls do not breed until their 8th year, and most do so between 12 and 18 years of age. Cows do not enter the breeding population until their 10th year. The apparent gestation period is 11.5 months and single births are the rule. Pups of the Canadian and Baltic populations are born mostly in February, whereas most of those in Britain are born in September and October. The pups are weaned in about 3 weeks, at which time mating occurs.

Age-Growth Data.—Following birth the pup gains about 1.4 kg per day and weighs about 41-45 kg when weaned at about 3 weeks. It begins to molt after the third week. When the molt is completed, they make their way to the sea.

and disperse. When caught as yearlings they have changed little in weight (40 kg) but measure 115 to 127 cm in length. The cows molt annually between late January and April, and males between late February and May. Estimated by dental rings, captive gray seals have reached an age of 41 to 42 years, and wild seals have reached an age of up to 35 years.

Feeding Habits.—The adult seals feed chiefly on skates, mackerel, flounders, cod, hake, and herring; and occasionally salmon, haddock, sea bass, dogfish, squid, and crustaceans.

Parasites and Diseases.—In the Baltic Sea, the seals harbor an anisakine nematode, *Terranova (Porracaecum) decipiens*.

Ecological Problems.—People occasionally harass the animals and use them for target practice.

Allocation Problems.—A significant indirect cause of damage by gray seals to fisheries in the waters around the British Isles and off Canada is the harboring by the seals of an anisakine nematode, *Terranova (Porracaecum) decipiens*, the larvae of which infest cod and other gadids, reducing their commercial value.

Current Research.—Research on biology, ecology, and populations continues by Canadian and British Governments and private groups. Some work is also being carried out by the University of Massachusetts on Muskeget Island and by the State of Maine.

REFERENCES

- Andrews, J. C., and P. R. Mott. 1967. Gray seals at Nantucket, Massachusetts. *J. Mammal.* 48:657-658.
- Backhouse, K. M., and H. R. Hewer. 1957. A note on spring pupping in the gray seal (*Halichoerus grypus* Fabr.). *Proc. Zool. Soc. London*, 128(4): 593-594, 1 pl.
- Banfield, A. W. F. 1974. The mammals of Canada. Univ. Toronto Press, 438 pp.
- Bonner, W. N. 1972. The gray seal and common seal in European waters. *Oceanogr. Mar. Biol. Ann. Rev.*, 10:461-507.
- Bonner, W. N. 1973. Grey seals in the Baltic. IUCN, Sur. Serv. Comm., Suppl. Pap. No. 39:164-174.
- Bonner, W. N., and G. Hicklin. 1974. Seals of the Farne Islands, 1971-73. *Trans. of the Nat. Hist. Soc. of North Umbria*, 42(2): 65-84.
- Cameron, A. W. 1967. Breeding behavior in a colony of western Atlantic gray seals. *Can. J. Zool.*, 45:161-173.
- Dubrovskii, A. N. 1937. On the biology of the grey seal (*Halichoerus grypus* Fabr.). *Priroda*, Leningrad, No. 2, p. 107, Feb.
- Mansfield, A. W. 1963. Seals of arctic and eastern Canada. *Fish. Res. Bd. Can. Bull.* No. 137.
- . 1966. The grey seal in eastern Canada waters. *Can. Audubon*, 28:161-165.
- Platt, N. E., J. H. Prime, and Susan R. Witt-hames. 1974. The age of the grey seal at the Farne Islands. International Council for the Exploration of the Sea, C. M. 1974/N:3, Preliminary Report, 7 pp plus 3 figs.
- Smith, E. A. 1966. A review of the world's grey seal population. *J. Zool.*, 150:463-489.
- Seas populations, and interchanges between these two groups are not known to occur. In the latter group, the center of abundance is in the central Bering Sea. The ribbon seal bears and nurtures its pup on the sea ice. During winter and spring, the entire population is concentrated along the southern edge of the seasonal ice pack. Only a few ribbon seals remain with the ice edge as it retreats northward through Bering Strait. In summer and autumn, ribbon seals are believed to be pelagic, mainly in the ice-free Bering Sea.
- Abundance and Trends.**—The population of ribbon seals is relative low having been markedly reduced by commercial sealers of the Soviet Union during the 1960s. In recent years the species has been afforded increased protection by Soviet sealing regulations and its numbers may be increasing again. U.S. citizens harvest very few ribbon seals. The Alaska Dept. of Fish and Game (1973) estimates that the population probably does not exceed 100,000 animals, and Soviet estimates indicate a population of 80,000 to 90,000. Soviet sealers took less than 3,000 ribbon seals in 1973 from Bering and Okhotsk Seas. In Alaska, the native harvest is usually less than 250 per year.
- General Biology:**
- Species Statistics.**—Adults of both sexes average 155 cm in length and 80 kg in weight. A very large female was 179.7 cm long with a girth of 114.3 cm, a blubber thickness of 6.1 cm, and a weight of 148.2 kg. The pups are born with white coats.
- Reproductive Data.**—Pups are born from late March to mid-April and average about 10 kg and 80 cm. Males become sexually mature between 3 and 5 years of age; females between 2 and 4 years of age. The species breeds annually, and pregnancy (including delayed implantation) probably lasts 10.5 months. A very large 23-year-old female (see measurements given above) obtained in March was carrying a near-term fetus.
- Age-Growth Data.**—The pup nurses for about 4 weeks, during which time its weight triples. Maximum longevity is estimated at 26 years.
- Feeding Habits.**—The diet of these seals during late winter and early spring (in the ice edge zone) includes mainly pelagic and demersal fishes, cephalopods, and small crustaceans.
- Parasites and Diseases.**—Ribbon seals host anisakid round worms in the stomach and corynosomid acanthocephalans in the intestine.
- Ecological Problems.**—None known.
- Allocation Problems.**—None known.
- REFERENCES**
- Alaska Department of Fish and Game. 1973. Marine mammals status report. Unpublished report, Juneau, AK.
- Burns, J. J. 1969. Marine mammal report. Fed. Aid Segment Report, vol. X. Unpublished, Alaska Dept. Fish Game, Juneau, AK. 25 p.
- . 1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. *J. Mammal.* 51:445-454.
- Bychkov, V. A. 1971. Pinnipeds of the USSR. P. 59-74 In Shaposhnikov, L. K. (ed.), Review of the status of USSR Pinnipedia conservation, Min. Sel. Khoz. SSSR, Tsentr. Lab. Okhr. Priro., Moscow, Transl. IPST 650946.
- Fay, F. H. 1973. The role of ice in the ecology of marine mammals of the Bering Sea. Paper presented at International Symposium for Bering Sea Study, 30 Jan.-4 Feb. 1972, Hakodate, Japan. (In press.)
- Popov, L. A. 1975 of Main Ice Forms of seals inhabiting waters of the USSR and adjacent to the Country Marine Areas, Report of Working Group III, Advisory Committee on Marine Research, Food and Agriculture Organization, United Nations, Sept. 1975, Seattle, Washington.
- Tikhomirov, E. A. 1966. On the reproduction of the seals belonging to the family Phocidae in the North Pacific. *Zool. Zhur.* 45(2): 275-281. (Transl. by George Tschukow-Roux, Auke Bay Biol. Lab., Juneau, AK.)

HARP SEAL

(*Pagophilus groenlandicus*)

Distribution and Migration.—The harp seal occurs in pack ice in the North Atlantic Ocean from Europe to eastern Canada. In the spring, it migrates south for breeding to the White Sea, to the Greenland Sea north of 73° N, and to southern Labrador, northeastern Newfoundland, and the Gulf of St. Lawrence.

Abundance and Trends.—Three breed-stocks of harp seals are known, the eastern (White Sea), central (Norwegian Sea around Jan Mayen Island), and western (Newfoundland). The latter is divided into two substocks, one east of Belle Isle on winter pack ice drifting southward—the "Front," and the other in the southern Gulf of St. Lawrence on winter ice formed in situ—the "Gulf." Sergeant (1973) estimates the total eastern Canadian population at 1.3 million. The number of pups born decreased from about 400,000 in 1960 to 300,000 in 1970. The population size in 1970 was less than that giving maximum production, and estimates indicated the 1970 catch was well in excess of the sustainable yield (International Commission for the Northwest Atlantic Fisheries. 1971. Redbook, Part I, Standing Committee on Research and Statistics Proceedings, annual meeting). According to Bychkov (1971), harp seal stocks of the northeastern Atlantic and Arctic Oceans (White Sea, Jan Mayen Island, and Newfoundland populations) numbered 3.0-3.5 million in the mid-20th century. Bychkov (1971) also stated that the White Sea population total 3.0-3.5 million animals in 1926-28 and only 400,000 in the 1960's.

In 1971 the International Commission for the Northwest Atlantic Fisheries banned seal hunting in the Gulf of St. Lawrence from large vessels and from aircraft and set a quota of 150,000 harp seals for the hunt off Newfoundland and Labrador by Canadian and Norwegian nationals.

General Biology:

Species Statistics.—The adults grow to about 1.8 m and 180 kg; newborn pups are about 0.6 m long and weigh 9.0 kg.

Reproductive Data.—The females mature at age 4-6 years and bear a single

RIBBON SEAL (*Histiophoca fasciata*)

Distribution and Migration.—Geographically, the ribbon seal is separable into the Okhotsk and Bering-Chukchi

pup annually after a gestation period of about 7.5 months. The pups are born from late January to early April, and are nursed for 10 to 12 days, by which time they have attained a weight of 38-40 kg.

Age-Growth Data.—Molting by the pups is completed at 4 weeks. The maximum life span is about 30 years.

Feeding Habits.—Pups feed primarily on small pelagic crustaceans, and small fish. The food of adults includes capelin, herring, cod, polar cod, flatfish, redfish, skate, barracudina, and various crustaceans.

Ecological Problems.—One species of helminth affecting the harp seal is also found in the muscles of ground fish, particularly cod, necessitating expensive removal by hand.

Allocation Problems.—The harp seal may eventually conflict with man over capelin stocks as this fishery expands. Several animal protection societies object to the harvest of harp seals.

Current Research.—Canadian, Danish, Norwegian, and Soviet Government scientists are studying the population of harp seals. At the University of Guelph, scientists are studying the biology of this mammal.

REFERENCES

- Bychkov, V. A. 1971. Pinnipeds of the USSR. p. 59-74 In Shaposhnikov, L. K. (ed.), Review of the status of USSR Pinnipedia conservation. Min. Sel. Khoz. SSSR, Tsant. Lab. Okh. Prir., Moscow, 129 p. IPST 650946, 1972.
- Fisher, H. D. 1952. Harp seals of the North-west Atlantic. *Fish. Res. Bd. Can. Gen. Ser.* No. 20.
- 1954. Studies on reproduction in the harp seal *Phoca groenlandica* Erleben in the northwest Atlantic. Ph.D. thesis, 133 p.
- Sergeant, D. E. 1973. Feeding (growth, and productivity of Northwest Atlantic harp seal (*Pagophilus groenlandicus*). *J. Fish. Res. Bd. Can.* 30:17-29.
- Silvertsen, E. 1941. On the biology of the harp seal. *Hvalrad. Skr.* 26:10+166 p., 11 pls.

BEARDED SEAL

(*Erignathus barbatus*)

Distribution and Migration.—The bearded seal is found in the North Pacific region in the Bering, Okhotsk, and northern Japan Seas and is circumpolar in the Arctic Ocean. In winter and spring it is found from the southern edge of the seasonal ice pack, north to permanent ice, wherever areas of broken, moving ice exist. During summer and autumn, it occurs along the edge of the permanent polar ice of the Arctic Ocean. Marked seasonal migrations are associated with the advance and retreat of the seasonal ice. The bearded seal is usually solitary, though very loose aggregations are sometimes observed during the breeding season. It does not formally come ashore.

Abundance and Trends.—All populations seem to be at high levels and relatively stable. A Soviet estimate places the population at 450,000 animals in the East-Siberian, Chukchi, Bering, Okhotsk, and Japan Seas (Bychkov, 1971). The Alaska Department of Fish and Game estimates a population of 300,000 animals in the Bering, Chukchi, East-Siberian, and Beaufort Seas (Alaska Department

of Fish and Game, 1973). The combined U.S. native and Soviet harvest in the Bering, Okhotsk and Chukchi Seas is 2,000 to 10,000 seals per year, well within the biological productivity of this species. Hunting loss, however, is high (op. cit.). Soviet pelagic sealing has been prohibited since 1970. Land quotas are 5,000 for Okhotsk Sea and 3,000 for Bering Sea. U.S. subsistence catch has been less than 3,000 animals.

General Biology:

Species Statistics.—The bearded seal is the largest phocid of the western arctic and subarctic. Large adults attain a winter weight in excess of 340 kg. From June through September the adults weight from 215 to 240 kg and average 236 cm in length. Some adult females are slightly larger than adult males. The pelage is a smoky-gray with a darker brown cap and dorsum. Newborn pups weigh about 31 kg and are 132 cm long, and have a gray-brown natal coat.

Reproductive Data.—The males become sexually mature at 6 or 7 years. Some females ovulate at age 3 years, but reproductive maturity is not attained until age 5 or 6 years. Female bearded seals are unique among northern seals in that they possess four mammary teats instead of the usual two, and produce one pup every other year instead of annually. A single pup is born, usually during late April or early May. The female does not ovulate until early June when the males are out of breeding condition, therefore, they must wait a year to be mated again. The period of pregnancy is 10.5 months, including 2.5 months of delayed implantation.

Age-Growth Data.—The weight of the pups triples by the end of the 12- to 18-day nursing period. They then molt their natal coat for one similar to the adult's, although it is sometimes spotted. The adults probably molt shortly after mating. Yearlings are about 160 cm long. Bearded seals attain full growth at about 10 years of age and average 235 cm long in the eastern Canadian arctic and 225 cm at Svalbard. At Svalbard, age groups are fully recruited at age 9 years and live to about 31 years.

Polar bears are a natural enemy of the bearded seal.

Feeding Habits.—The bearded seal consumes several species of invertebrates, principally crabs, shrimps, clams, and amphipods, and some demersal fishes.

Parasites and Diseases.—Most bearded seals, other than nursing pups, are heavily parasitized by anisakid round worms in the stomach, acanthocephalans and diphyllbothrid cestodes, in the intestine, and lice on the skin.

Ecological Problems.—The bearded seal is the final host for anisakid worms that infect fishes, but this problem is unimportant in Alaska at present. About 1% of these animals harbor *Trichinella spiralis*, the cause of trichinosis in man.

Allocation Problems.—None known. Bearded seals consume commercially important pandalid and crangonid shrimps and lithode crabs; however, they do not compete directly for commercial fishes, nor do they damage fishing gear.

Current Research.—None known.

REFERENCES

- Alaska Department of Fish and Game, 1973. Marine mammal status reports. Unpublished report, Juneau, AK.
- Benjaminsen, Terje. 1973. Age determination and the growth and age distribution from cementum growth layers of bearded seals at Svalbard. *Fisk. Dir. Ser. Havunders.* 16: 159-170.
- Burns, J. J. 1976. The Pacific bearded seal. Alaska Dept. Fish Game, Juneau, 66 p.
- 1970. Remarks on the distribution and history of pagophilic pinnipeds in the Bering and Chukchi Seas. *J. Mammal.* 51:445-454.
- Bychkov, V. A. 1971. Pinnipeds of the USSR. P. 59-74 In Shaposhnikov, L. K. (ed.), Review of the status of USSR Pinnipeds conservation. Min. Sel. Khoz. SSSR, Tsant. Lab. Okh. Prir., Moscow. Transl. IPST 650946.
- Pay, F. H. 1973. The role of ice in the ecology of marine mammals of the Bering Sea. Paper presented at International Symposium for Bering Sea Study, 29 Jan.-4 Feb., 1972, Hokodate, Japan. (In press.)
- McLaren, I. A. 1958. Some aspects of growth and reproduction of the bearded seal, *Erignathus barbatus* (Erxleben). *J. Fish. Res. Bd. Can.* 15:219-227.
- Popov, L. A. 1975. Status of Main Ice Forms of seals inhabiting waters of the USSR and adjacent to the Country Marine Areas. Report of Working Group III, Advisory Committee on Marine Research, Food and Agriculture Organization, United Nations, Sept. 1975, Seattle, Washington.

CARIBBEAN MONK SEAL

(*Monachus tropicalis*)

The Caribbean monk seal is classified as endangered in the Red Book of the International Union for the Conservation of Nature. From 17 to 29 March 1973, the Bureau of Sport Fisheries and Wildlife, Department of the Interior, conducted an aerial survey of this species' former habitat in the Gulf of Mexico and Caribbean Sea. The conclusion is that the Caribbean monk seal is now extinct. (Kenyon, In press.)

From the 1973 survey and from other field observations, it formerly inhabited shores and islands of the Greater Antilles, Bahamas, Yucatan Peninsula, and Florida Keys. It was reported at Seranilla Bank as late as 1952. A single pup was born, probably in alternate years. The adults grew to 2.4 m in length. The color was a uniform brownish gray above; the underparts were pale yellow or yellowish white. Monk seals were vulnerable to hunters because they were sluggish, unwary, and not easily alarmed.

REFERENCES

- Allen, G. M. 1942. Extinct and vanishing mammals of the western hemisphere with the marine species of all the oceans. *New York, Amer. Comm. Int. Wild Life Prot., Spec. Publ.* 11, 620 p.
- Elliot, H. W. 1864. The monk seal of the West Indies (*Monachus tropicalis*, Gray). *Science*, 111, p. 752.
- Gilmore, B. M. 1959. Is the West Indian seal extinct? *Sea Frontier*, 5(4):225-236.
- Gunter, G. 1947. Sight records of the West Indian seal, *Monachus tropicalis* (Gray), from the Texas coast. *J. Mammal.* 28:289-290.
- Kenyon, K. W. The Caribbean Monk Seal: Extinct. *J. Mammal.* In press.

- King, J. E. 1956. The monk seals (genus *Monachus*). Bull. Brit. Mus. (Nat. Hist.), Zool. 3: 217-246.
- Rice, Dale W. 1973. Caribbean monk seal (*Monachus tropicalis*). IUCN, Survival Service Commission, IUCN Pub. New Series, Suppl. Pap. No. 39: 99-112.
- Ward, L. 1887. (*Monachus tropicalis*). Notes of its life history. Amer. Natur. xxi, p. 254-264.

HAWAIIAN MONK SEAL

(*Monachus schauinslandi*)

Distribution and Migration.—The Hawaiian monk seals breeds only on French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, and Midway and Kure Atolls of the Leeward Hawaiian Islands. The first four of these islands are within the Hawaiian Islands National Wildlife Refuge (HINWR). Rarely do individuals wander southeastward to the main Hawaiian Islands. The species is not known to have a migratory pattern.

Abundance and Trends.—The total population was estimated at 1,350 in 1958 (Rice, 1960). It is not yet classified as endangered by the Office of Endangered Species. All work seals are considered endangered by the Convention on International Trade in Endangered Species of Wild Fauna and Flora, signed 3 March 1973. The International Union for Conservation of Nature and Natural Resources lists this species as vulnerable (i.e., likely to move to endangered status in the near future). Counts in the 1960's and 1970's suggest that the population is declining (Kenyon, 1973) due to human disturbance on pupping and nursing areas.

General Biology:

Species Statistics.—An adult female measures 2.3 m and her estimated weight is 273 kg. On the average, females outweigh adult males. A typical male is about 2.1 m long and weighs about 173 kg. The newborn pups weigh 16-17 kg, and are about 100 cm long.

Reproductive Data.—Observations of 47 tagged individuals on Kure Atoll indicate an annual reproductive rate of 15 living pups per 100 adults. About 19% of the adult females breed in successive years, and only 56% of the adult females had pups in either of two seasons.

The age at which Hawaiian monks seals of either sex first breed is not known, but they may do so at age 3 years. Pups are born from late December to July, with the peak in April and May. They nurse about 6 weeks.

Age-Growth Data.—The pup grows from 100 to about 130 cm during its first year. The weights of 6 yearlings averaged 45 kg. Two seals tagged as yearlings doubled their weight in their second year and one increased in length by 36% and the other by 15%. They probably do not attain full growth until at least 4 years of age. A technique developed for determining the ages of these seals by examination of the upper canine teeth indicated an age for one female of about 11 years and about 20 years for a male.

Sharks are serious predators.

Feeding Habits.—Spewings found on haul-out areas included the remains of reef and bottom fishes, cells, and cephalopods.

Ecological Problems.—Harassment of the monk seal by humans and dogs on Midway and Kure Atolls may be causing a problem by preventing these animals from using sheltered dry pupping areas.

Allocation Problems.—None known.

Current Research.—The HINWR Refuge Manager, United States Fish and Wildlife Service, has a pup tagging and recovery program in progress. The Refuge Manager also makes counts of animals on the beaches of the HINWR, usually in the spring and again in late summer. A cooperative study under direction of the NMFS will begin in 1976, and include the small populations on Midway and Kure Islands.

REFERENCES

- Kenyon, K. W. 1972. Man versus the monk seal. J. Mammal. 53: 687-696.
- 1973. Hawaiian monk seal (*Monachus schauinslandi*). IUCN, Survival Service Commission, IUCN Pub. New Series, Suppl. paper No. 39: 88-87.
- Kenyon, Karl W., and Clifford H. Fiscus. 1963. Age determination in the Hawaiian monk seal. J. Mammal., 44(2): 280-282.
- Kenyon, K. W., and D. W. Rice. 1959. Life history of the Hawaiian monk seal. Pac. Sci. 13: 215-252.
- King, J. E. 1956. The monk seals (genus *Monachus*). Bull. Brit. Mus. (Nat. Hist.), 3(5): 210-256, 8 pls.
- Rice, D. W. 1960. Population dynamics of the Hawaiian monk seal. J. Mammal. 41: 376-385.
- 1964. The Hawaiian monk seal, rare mammal surveys in Leeward Islands. Natur. Hist. 73(2): 48-55.
- Scheffer, V. B. 1958. Seals, Sea lions, and walruses; a review of the Pinnipedia. Stanford Univ. Press, 179 p. + 32 pls.
- Tomich, P. Quentin. 1969. Mammals in Hawaii. Bernice P. Bishop Museum Spec. Pub. 67, Bishop Museum Press, Honolulu, Hawaii, 238 pp.
- Wirtz, W. O., II. 1968. Reproduction, growth and development, and juvenile mortality in the Hawaiian monk seal. J. Mammal., 49: 229-238.

CRABEATER SEAL

(*Lobodon carcinophagus*)

Distribution and Migration.—The species is circumpolar and abundant in pack ice of the southern oceans. It is found as a straggler in Uruguay, New Zealand, Australia, Tasmania, and South America. Part of the population moves toward the coasts in summer and away from land in the winter.

Abundance and Trends.—The crab-eater seal is the most abundant species of seal in the Antarctic, with population estimates ranging from 2 to 5 million (Scheffer, 1958) to 30 million (Erickson, et al., 1971). Laws (1973) believes that the later estimate is unreliable, but that earlier estimates were too conservative. Gilbert (1974) is in general agreement with Laws and provides an estimate of 15,000,000.

Laws (1972) reports that a total of 1,251 crab-eater seals were killed or cap-

tured in the Antarctic Treaty area during the period 1964-1969, which does not pose a direct threat to these seals.

General Biology:

Species Statistics.—Adult males grow to a maximum length of about 2.6 m and 270 kg in weight. At birth the pups are about 1.4 m long and the natal color is gray-brown. Color ranges from black to silvery white, depending on the individual, its age, time of year in relation to the molt, and dampness of pelage.

Reproductive Data.—Little information is available on the breeding habits; mating has not been observed but sperm are present in the testes of males in October and November. Single pups are born during the Antarctic spring (mid-September to early November). Available data indicate that the adults attain sexual maturity between the 3rd and 6th years.

Age-Growth Data.—By January or February the pups have grown so large that they are difficult to distinguish from adults. The adults molt in January and February while partly fasting. The life span as determined from tooth sections is 29 years or more.

Killer whales and leopard seals are known to prey upon crab-eater seals, and may be responsible for the numerous scars on a high proportion of these animals.

Feeding Habits.—The principal food of the crab-eater seal is krill.

Parasites and Diseases.—The species has lice on the skin, roundworms in the stomach, and, rarely, tapeworms in the intestine.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—The University of Minnesota is studying population dynamics of Antarctic seals.

REFERENCES

- Bertram, G. C. L. 1940. The biology of the Weddell and crab-eater seal. Sci. Rep. Brit. Graham Land Exped. 1934-37, 1: 1-39.
- Ecklund, C., and E. A. Atwood. 1961. A population study of Antarctic seals. J. Mammal. 43: 229-238.
- Erickson, Albert W., and Robert J. Hofman. 1974. Antarctic seals. In Antarctic Mammals, Antarctic map folio series, Folio 18. Amer. Geogr. Soc., pp. 4-13.
- Erickson, A. W., D. B. Siniff, D. R. Cline, and R. J. Hofman. 1971. Distributional ecology of Antarctic seals. P. 55-75 In Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970, Sir George Deacon (ed.).
- Gilbert, J. R. 1974. Abundance and distribution of seals in Antarctic pack ice. Ph.D. Dissertation, University of Idaho.
- Laws, R. M. 1972. Seals and birds killed and captured in the Antarctic Treaty area, 1964-1969. The Polar Record, 16(101): 303-364.
- 1973. The current status of seals in the Southern Hemisphere. IUCN, Survival Service Commission, IUCN Pub. New Series, Suppl. Pap. No. 39: 141-161.
- Laws, R. M., and R. J. F. Taylor. 1957. A mass dying of crab-eater seals, *Lobodon carcinophagus* (Gray) Proc. Zool. Soc. London, 129: 315-324.
- Oritsland, Torger. 1970. Biology and population dynamics of Antarctic seals. P. 361-366 In Holdgate, M. W. (ed.), Antarctic Ecology 1: 1-604.

1970. Sealing and seal research in the northwest Atlantic. September-October 1964. P. 367-367. In Holdgate, M. W. (ed.), *Antarctic Ecology* 1:1-604.
- Scheffer, V. B. 1958. Seals, sea lions, and walrus: a review of the Pinnipedia. Stanford Univ. Press, 179 p. plus 32 pls.
- Seal, U. S., A. W. Erickson, D. B. Siniff, and R. J. Hofman. 1971. Biochemical, population genetic, phylogenetic and cytological studies of Antarctic seal species. P. 77-95. In Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970, Sir George Deacon (ed.).
- Siniff, D. B., D. R. Cline, and A. W. Erickson. 1970. Population densities of seals in the Weddell Sea, Antarctic, in 1968. P. 377-394. In Holdgate, M. W. (ed.), *Antarctic Ecology*. 1. Academic Press, London.

HOODED SEAL

(Cystophora cristata)

Distribution and Migration.—The hooded seal occurs mainly in the east Greenland pack ice from Bear Island and Spitzbergen to Jan Mayen, Iceland, and Denmark Strait. It also occurs off southern Greenland, southeastern Labrador, and the Gulf of St. Lawrence. Stragglers appear on the American coast as far south as Cape Kennedy, Florida, along the Canadian Arctic coast as far west as Herschel Island, and on the European coast as far south as the Bay of Biscay, France. Hooded seals prefer deep water and thick, drifting ice floes.

In March of 1974, an aerial survey by the Fisheries and Marine Service of Canada rediscovered a whelping population that had been reported by two different sources, one in 1840 and the second in 1873. The seals were located between 63°30' and 64°20'N, 56°00' and 56°30'W. There were adults, pups and blood patches, indicating that births had taken place recently. Total numbers were estimated to be 50,000 animals. This population is believed to be the source of recruitment that maintains the herd of hooded seals at icefields east of Newfoundland where the species is heavily hunted.

Abundance and Trends.—Hooded seals of all ages are harvested commercially when the animals are congregated for molting. According to Scheffer (1958), the herds in the middle of the 20th century were estimated at 300,000 to 500,000. Sergeant (1965) states that the catch rate of hooded seals has been high. The average annual kill from the Jan Mayen Island herd declined from about 53,000 (1949-53) to about 40,000 (1959-63) (Popov, 1967).

General Biology:

Species Statistics.—Adult males grow to 2.7-3.0 m and 408 kg; females are slightly smaller. The adult coat is gray, covered with black patches of irregular size. The pups shed their light gray embryonal hair before birth and when born have an exceptionally beautiful silver gray coat dorsally with a creamy white ventral surface.

Reproductive Data.—The pups are born from late March to early April, are 1.1 m long, and weigh 23 kg. Seals of both sexes mature at age 4-6 years. The adults mate when the lactation period ends (about 2 weeks).

Age-Growth Data.—The pups are nursed about two weeks. The adults return to sea after mating, leaving the pups on the ice where they remain an additional 2 weeks before following the adults. Hooded seals of all ages are preyed upon by polar bears.

Feeding Habits.—Hooded seals feed on octopus, squid, rosefish, herring, capelin, cod, shrimp, mussels, and starfish.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—Research on the hooded seal is carried out by the Fisheries Research Board of Canada, Denmark (Grønlands Fiskerifundersøgelse), Norway (Fiskeridirektoratets Havforskningens Institutt), and the Soviet Union (VNIRO).

REFERENCES

- King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.) London, 154 p.
- Mansfield, A. W. 1967. Seals of arctic and eastern Canada, 2d ed. (revised). Fish Res. B. Can. Bull. 137, 30 p.
- Popov, L. A. 1957. Modern marine animal hunting industry of the North Atlantic Seas. *Problemy Severa* (11):160-165.
- Rasmussen, B. 1960. Om Klappmyssbestanden i det nordlige Atlanterhav (On the stock of hood seals in the North Atlantic). *Fisken og Havet* (Bergen), No. 1, 23 p. Fish Res. B. Can. Transl. Series No. 337.
- 1962. Klappmyssen aldersfordeling i Danmarkstredet. *Fiskets Gang* (Bergen), No. 5.
- Scheffer, V. B. Seals, sea lions, and walrus: a review of the Pinnipedia. Stanford Univ. Press, Stanford, Calif.
- Sergeant, D. E. 1965. Exploitation and conservation of harp and hood seals. *Polar Record* 12(80):541-551.
- 1974. A rediscovered whelping population of hooded seals, *Cystophora cristata* Erleben and its possible relationship to other populations. *Polarforschung*, 44, Nr. 1:1-7.

LEOPARD SEAL

(Hydrurga leptonyx)

Distribution and Migration.—Leopard seals are circumpolar in Antarctic pack ice and in southern temperature regions and subarctic islands in the winter. They are occasionally seen off the southern tips of New Zealand, Australia, South America, and South Africa.

Abundance and Trends.—The leopard seal is a solitary animal. Scheffer (1958) estimated the population at 100-300,000. More recently, in 1972, Laws (1973) estimated the population at 250,000 to 500,000.

Laws (1972) reports that 140 leopard seals were killed or captured in the Antarctic Treaty area, which does not indicate any threat to the population.

General Biology:

Species Statistics.—The adult males grow to 3.0 m in length and 450 kg in weight; adult females reach 3.3 m in length and 500 kg in weight. Leopard seals have a long slim body, large head, and wide gape. Newborn pups are 1.6 m long and weigh 29.5 kg. The color of adults is dark gray dorsally and light gray ventrally, and a variable amount of spotting is present.

Reproductive Data.—Males are sexually mature at 3-7 years and females

at 2-6 years. Analysis of random specimens indicates that parturition occurs between October and December but unlike crabeater and Weddell seals, breeding may not occur until January-March. The gestation period is 240 days. Lactation lasts about 2 months.

Age-Growth Data.—The life span of both sexes is judged to be more than 25 years, based on studies of tooth sections.

Feeding Habits.—The leopard seal, largest of the Antarctic seals, is the one seal that regularly feeds on warm blooded animals. Their food consists of other seals, euphausiids, penguins, whale carcasses, fish and squid.

Parasites and Diseases.—Leopard seals suffer from diseased teeth, tumors, but nodules in nasal passages, and stomach carcinomas.

Ecological Problems.—Kill harve could have deleterious effect upon population size.

Allocation Problems.—None known.

Current Research.—The University of Minnesota is studying population dynamics of Antarctic seals.

REFERENCES

- Brown, W. N., and R. M. Laws. 1964. Sex and sealine. In *Antarctic Research: a review of British scientific achievement: Antarctica: 163-190*. R. Priestly, R. S. Adl and G. de Q. Robin (eds.), London, Butterworths.
- Brown, K. G. 1957. The leopard seal at New Island, 1951-54. A.N.A.R.E. Interim Rep. N 18:1-84.
- Erickson, Albert W., and Robert J. Hofman. 1974. Antarctic seals. In *Antarctic Marine mammals*, Antarctic map folio series, Folio 1. Amer. Geogr. Soc., pp. 4-13.
- Erickson, A. W., D. B. Siniff, D. R. Cline, and R. J. Hofman. 1971. Distributional ecology of Antarctic seals. P. 55-75. In Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970, Sir George Deacon (ed.).
- Laws, R. M. 1964. Comparative biology of Antarctic seals. P. 445-457. In Carrick, R. M. Holdgate, and J. Prevost (eds.), *Biological Antarctic-Antarctic Biology*, Herman, Paris.
- 1972. Seals and birds killed and captured in the Antarctic Treaty Area, 1964-1969. *The Polar Record* 16(101):343-364.
- 1973. The current status of seals in the Southern Hemisphere. IUCN, Survival Service Commission, IUCN Pub. New Series, Suppl. Pap. No. 39:144-161.
- Oritsland, Torger. 1970. Biology and population dynamics of Antarctic seals. P. 361-366. In Holdgate, M. W. (ed.), *Antarctic ecology*, 1.
- Scheffer, V. B. 1958. Seals, sea lions, and walrus: a review of the Pinnipedia. Stanford Univ. Press, 179 p. +32 pls.
- Seal, U. S., A. W. Erickson, D. B. Siniff, and R. J. Hofman. 1971. Biochemical, population genetic, phylogenetic and cytological studies of Antarctic seal species. P. 77-95. In Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970, Sir George Deacon (ed.).

WEDDELL SEAL

(Leptonychotes weddelli)

Distribution and Migration.—This species is circumpolar in fast ice around Antarctica, occasionally reaching as far north as Uruguay (lat. 35°S). It is lit-

toral in distribution and nonmigratory. Because of its occurrence near scientific stations it is the best known of the Antarctic seals.

Abundance and Trends.—The population was estimated to be 200,000 to 500,000 by Scheffer (1958) and 250,000 to 500, by Laws (1973). Recent investigations (Erickson and Hofman, 1974) suggest a total population in excess of 756,000. Gilbert (1974) estimated 730,000 in pack ice alone (excluding animals in shore fast ice).

Laws (1972) reports that a total of 893 Weddell seals were killed or captured in the Antarctic Treaty area during the period 1964-1969, which poses no threat to the population.

General Biology:

Species Statistics.—Adult males grow to 3.2 m in length and may reach 450 kg in weight. Females are slightly larger than males. Newborn pups are 1.5 m long, weigh 29 kg, and have permanent dentition. Coloration of adults is dark brown to black, conspicuously mottled with white spots.

Reproductive Data.—Males reach sexual maturity at 6 to 8 years; females at 3 years of age. The average age of breeding females is 9 years. Pregnancy lasts 9 to 10 months. The pups are born from September to early November on fast ice, usually close to the Antarctic continent. The mating period has not been defined but males with sperm and females that had ovulated have been collected between late November and mid-December. Lactation lasts 6-7 weeks and pups are weaned at 6 weeks. The females protect their pups and are aggressive toward intruders.

Age-Growth Data.—The pups molt their natal fur and replace it with the adult pelage by the 44th day. Initial weight gains are dramatic: the pups gain an average of 12 kg or more per week for the first 6 weeks and weigh as much as 135 kg by the time the molt is completed. The life span, as determined by the teeth, is not over 20 years.

Tooth wear associated with maintaining breathing holes may be a mortality factor.

Feeding habits.—Weddell seals feed on mysids, decapod crustaceans, amphipods, cephalopods, euphausiids, and various species of fish.

Parasites and Diseases.—Wounds inflicted on this mammal heal slowly, and festering sores are common. Kidney stones and uterine fibroids have been found. Weddell seals are heavily infested with tapeworms, trematodes, and roundworms.

Ecological Problems.—Local populations are discrete breeding units which could be eliminated by oil slicks.

Allocation Problems.—None known.

Current Research.—The University of Minnesota is studying population dynamics of Antarctic seals.

REFERENCES

- Bertram, G. C. L. 1940. The biology of the Weddell and crabeater seals. Sci. Rep. Brit. Graham Land Exped. 1934-37, 1:1-319.
Dearborn, J. H. 1965. Food and Weddell seals at McMurdo Sound, Antarctica. J. Mammal. 46:37-43.

Eklund, C., and E. A. Atwood. 1962. A population study of Antarctic seals. J. Mammal. 43:229-238.

Erickson, A. W., D. B. Siniff, D. R. Cline, and R. J. Hofman. 1971. Distributional ecology of Antarctic seals. P. 55-75 In Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970, Sir George Deacon (ed.).

Erickson, Albert W., and Robert J. Hofman. 1974. Antarctic seals In Antarctic Mammals, Antarctic map folio series, Folio 18, Amer. Geogr. Soc., pp. 4-13.

Gilbert, J. R. 1974. The biology and distribution of seals in Antarctic pack ice. Ph.D. Dissertation, University of Idaho.

Kaufmann, G. D., D. B. Siniff, and R. Reichle. 1972. Colony behavior of Weddell seals, *Leptonychotes weddellii*, at Hutton Cliffs, Antarctic. In Symposium on the biology of the seal, Guelph, Ontario, August 14-17, 1972.

Laws, R. M. 1972. Seals and birds killed and captured in the Antarctic Treaty area, 1964-69. The Polar Record, 16(101):343-364.

Laws, R. M. 1973. The current status of seals in the Southern Hemisphere. IUCN/SSC Working Group on Threatened and Depleted Seals of the World. Guelph, Ontario, August 1972.

Mansfield, A. W. 1958. The breeding behavior and reproductive cycle of the Weddell seal (*Leptonychotes weddellii* Lesson). Falkland Islands Dep. Surv. Sci. Rep. 18:1-41.

Scheffer, V. B. 1958. Seals, sea lions and walrus; a review of the Pinnipedia. Stanford Univ. Press, 179 p. + 32 pls.

Siniff, D. B., D. R. Cline, and A. W. Erickson. 1970. Population densities of seals in the Weddell Sea, Antarctica, in 1968. p. 377-394 In Holdgate, M. W. (ed.), Antarctic Ecology, 1:1-604.

Siniff, D. B., J. R. Tester, and V. B. Kuechle. 1971. Some observations on the activity patterns of Weddell seals as recorded by telemetry. P. 173-180 In Burt, W. H. (ed.), Antarctic Pinnipedia, Antarctic Research Series, 18.

Stirling, I. 1971. Population dynamics of the Weddell seal (*Leptonychotes weddellii*) in McMurdo Sound, Antarctica, 1966-68. P. 141-167 In Burt, W. H. (ed.), Antarctic Pinnipedia, Antarctic Research Series, 18.

SOUTHERN ELEPHANT SEAL

(*Mirounga leonina*)

Distribution and Migration.—The southern elephant seal is circumpolar on subantarctic islands, south to the ice edge of lat. 78°S. It breeds on the continental coast of Argentina, and on subantarctic islands.

Abundance and Trends.—The population of the southern elephant seal has been estimated at 600,000±100,000 (Laws, 1960). This species was once sought for its oil. It was nearly extinct by 1900, but since that time regulations have allowed the herds to increase. At South Georgia the average annual kill between 1952 and 1964 was 6,000 animals. There has been no commercial sealing there since 1964, although licenses to harvest these animals have been offered (Laws, 1973).

Laws (1972) reported a total of 25 southern elephant seals killed or captured in the Antarctic Treaty area during the period 1964-69, and states that clearly there is at present no serious direct threat to these seals, although one cannot rule out the possibility of restricted over-exploitation of some local populations.

General Biology:

Species Statistics.—The southern elephant seal is the largest pinniped. Males grow to 5.5-6.1 m in length and 3,628 kg in weight; females reach 3.1-3.7 m and 907 kg. The newborn pups are 1.2 m long and weigh from 37.6 to 49 kg.

Reproductive Data.—Males are sexually mature at 4 years, and hold harems at 5-7 years in commercially utilized populations. The females mature at age 2 years and bear single pups at age 3. In unutilized populations, the females mature at age 3-6 years, but the males do not reach harem status until 12 years old. The breeding season varies with locale and occurs from August through November. Most harems contain 20 to 40 females, but up to 100 have been counted. The pups are born in October, about 1 week after the females haul out, and nurse about 23 days. The females mate about 18 days after their pups are born.

Age-Growth Data.—The pups weigh 113 to 181 kg at weaning. The molt usually starts in early November, when the pups, then 2-3 weeks old, shed their natal fur and older immature seals begin to haul-out to molt. Mature females begin their molt in late December or January and mature males in late January or February. The molt requires about 18 days to complete. After the molt, they return to the sea and probably spend the winter feeding near pack ice.

The females live about 12 years and the males up to 20 years.

The leopard seal and killer whale are natural enemies of the southern elephant seal.

Feeding Habits.—Shortly after weaning the pups feed on amphipods for a time, after which they feed primarily on cephalopods and fish.

Ecological Problems.—None known.

Allocation Problems.—According to Laws (1973) the southern elephant seal may become threatened because they compete with Soviet fishermen for commercial species of fish in the vicinity of Kerguelen Islands.

Current Research.—The University of Minnesota makes incidental observations of this mammal while studying the Antarctic seal species.

REFERENCES

- Carrick, R., and S. E. Ingham. 1962. Studies on the southern elephant seal. Pt. 5, Population dynamics and utilization. Commonwealth Sci. Ind. Res. Org. (CSIRO) Wildl. Res., 7:161-197.
Cline, D. R., A. W. Erickson, and R. J. Hofman. 1970. Elephant seal in the Weddell Sea. J. Mammal., 51:204.
Erickson, Albert W., and Robert J. Hofman. 1974. Antarctic seals. In Antarctic Mammals, Antarctic Map Folio Series, Folio 18, Amer. Geogr. Soc., pp. 4-13.
King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.), London, 154 p.
Laws, R. M. 1953. The elephant seal (*Mirounga leonina*, Linn.). I. Age and growth. Falkland Islands Dep. Surv. Sci. Rep. 8, 62 p.
— 1956. The elephant seal (*Mirounga leonina*, Linn.). II. General social, reproductive behavior. Falkland Islands Dep. Surv. Sci. Rep. 13, 88 p.

- 1964. The elephant seal (*Mirounga leonina* Linn.). The physiology of reproduction. Fisheries and Wildlife Service, U.S. Fish and Wildlife Service, Washington, D.C. 16 p.
- 1960. The southern elephant seal (*Mirounga leonina* Linn.) at South Georgia. Nord. Hvalfangst-Tid. 49(10): 111:466-476, 529-542.
- 1972. Seals and birds killed and captured in the Antarctic Treaty area, 1964-69. The Polar Record, 16(101):343-364.
- 1973. The current status of seals in the Southern Hemisphere. IUCN, Survival Service Commission, IUCN, New Pub. Ser., Supple. Pap. No. 39:144-161.

NORTHERN ELEPHANT SEAL
(*Mirounga angustirostris*)

Distribution and Migration.—This species originally occupied rookeries and hauling grounds on the mainland and islands from Cabo San Lazaro, Baja California, northward to Pt. Reyes, just north of San Francisco. Nonbreeding animals range at least as far north as southeastern Alaska.

This species is now known to breed on Isla San Benito, Islas Los Coronados, Isla Cedros, San Miguel Island, Santa Barbara Island, San Nicolas Island, and Ano Nuevo Island. Also, a northern elephant seal was born on southeast Farallon Island January 20, 1972, indicating that this species is continuing to expand its breeding range northward since its near-extirmination during the last century (LeBoeuf, et al., 1974).

Abundance and Trends.—By 1890 the population had been reduced to 100 or fewer animals found only on Guadalupe Island, but this number increased to an estimated 15,000 animals by 1960 (Bartholomew and Hubbs, 1960). A total of 10,581 were counted in April 1968 on the six Mexican islands off Baja California (Brownell, et al., 1974). Peterson and LeBoeuf (1969) estimated a population of about 30,000 in 1969. This species has reoccupied most or all of its historic rookeries and hauling grounds.

The California Department of Fish and Game has counted elephant seals during sea lion censuses in early June since 1965 (Carlisle and Aplin, 1971). Carlisle (1973) has counted *Mirounga* on San Miguel Island each year from 1965 through 1973 except 1968. Recent California counts do not indicate any trend in abundance.

Odell (1974) believes that the San Nicolas Island population is increasing. The largest California population of *Mirounga* is found in San Miguel Island, where Johnson and DeLong (pers. comm.) suggest the population is increasing. Carlisle (1973) counted 3,600 in 1973.

General Biology:

Species Statistics.—Maximum body lengths are about 5 m for adult males and 3.3 m for adult females. Newborn pups are about 1.2 m long and have black natal pelage.

Reproductive Data.—The adults males usually arrive first on the rookeries in November, followed by the pregnant females in December. Dominant adult males occupy choice locations within the

breeding colonies and do most of the mating. The female usually bears a single pup about 7 days after her arrival and weans it about a month later. The female is bred during her last few days ashore. Most pups are born January 1 to February 10.

Age-Growth Data.—On San Nicolas Island most pups have molted their black natal pelage for the gray pelage of older animals by 1 March. The age at which the pups go to sea is not firmly established but they spend at least 2 to 3 months ashore. Older animals return to shore to molt beginning with the females about 1 April, followed by immatures of both sexes, and the males are the last to return.

Feeding Habits.—Little information on the feeding habits of *Mirounga* is available. The stomach of one elephant seal contained seven ratfish, one 66.0 cm California dogfish shark, one swell or puffer shark, three skates, and four squids. The species apparently can feed at considerable depths, as indicated by prey species and the fact that three young *Mirounga* were taken on hooks set at about 100 fathoms. The stomach of a subadult male found dead in California contained the remains of cusk eels, toadfishes, scorpionfishes, flounder, cat sharks, and segments of undetermined Teleosts and Elasmobranchs.

Ecological Problems.—Oil from the Santa Barbara spill of 28 January 1969 coated about 100 elephant seal pups ashore on one area of San Miguel Island. The pups had been weaned and apparently suffered no ill effects.

Allocation Problems.—Not known.

Current Research.—Scientists from the University of California at Santa Cruz, California, are studying this species.

REFERENCES

- Anthony, A. W. 1925. Expedition to Guadalupe Island, Mexico in 1922. Calif. Acad. Sci., fourth series, 4(13):277-320.
- Bartholomew, G. A. 1952. Reproductive and social behavior of the northern elephant seal. Univ. Calif. Publ. Zool. 47(15):369-471, pls. 38-57, 2 figs.
- 1967. Seal and sea lion populations of the California Islands. P. 229-244 In Philbrick, R. N. (ed.) Proceedings of the Symposium on the Biology of the California Islands, Santa Barbara Botanic Garden.
- Bartholomew, G. A., and C. L. Hubbs. 1960. Population growth and seasonal movements of the northern elephant seal, *Mirounga angustirostris* Mammalia 24:313-324.
- Brownell, Robert L., Jr., R. L. DeLong, and R. W. Schreiber. 1974. Pinniped populations at Islas de Guadalupe, San Benito, Cedros, and Natividad, Baja California, in 1968. Jour. Mammal., 55(3):469-472.
- Carlisle, John G., Jr. 1973. The census of northern elephant seals on San Miguel Island, 1965-73. Calif. Fish Games, 50(4):311-313.
- Carlisle, John G., and J. A. Aplin. 1971. Sea lion census for 1970, including counts of other California pinnipeds. Calif. Fish Game, 57:124-126.
- Daugherty, Anita E. 1965. Marine Mammals of California. Calif. Dept. Fish Game, Sacramento, Calif. 86 p.
- Huey, L. M. 1930. Capture of an elephant seal off San Diego, Calif., with notes on stomach contents. J. Mammal. 11:229-230.
- King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.), London, 154 p.
- LeBoeuf, Burney J. 1972. Sexual behavior in the northern elephant seal, *Mirounga angustirostris*. Behavior 41(1-2):1-26.
- Morejohn, G. Victor, and Donald M. Baltz. 1970. Contents of the stomach of an elephant seal. Jour. Mammal., 51(1):173-174.
- Odell, Daniel K. 1974. Seasonal occurrence of the northern elephant seal, *Mirounga angustirostris*, on San Nicolas Island, California. Jour. Mammal. 55(1):81-95.
- 1972. Studies on the biology of the California sea lion and the northern elephant seal on San Nicolas Island, Calif. Ph.D. thesis, Univ. Calif., Los Angeles, 168 p.
- Peterson, R. S., and B. J. LeBoeuf. 1969. Population study of seals and sea lions. Trans. 34th N. Amer. Wildl. Nat. Res. Conf., p. 74-79.
- Radford, K. W., R. T. Orr, and C. L. Hubbs. 1955. Reestablishment of the northern elephant seal (*Mirounga angustirostris*) off central California. Proc. Calif. Acad. Sci. 4th series, 31(22):601-612, 6 figs.
- Rice, D. W., K. W. Kenyon, and D. Liuch-B. 1965. Pinniped populations at Islas Guadalupe, San Benito, and Cedros, Baja California, in 1965. Trans. San Diego Soc. Nat. Hist. 14(7):73-84.
- Scammon, C. M. 1874. The marine mammals of the northwestern coast of North America. John H. Carmany and Co., San Francisco, California. 319 p.
- Scheffer, V. B. 1965. Deep diving of elephant seals. Murrelet 45(1):9.
- Townsend, C. H. 1912. The northern elephant seal. Zool. 1:159-173.

ROSS SEAL

(*Ommatophoca rossi*)

Distribution and Migration.—The species is circumpolar in heavy pack ice of the Antarctic Ocean.

Abundance and Trends.—The Ross seal is usually solitary. Scheffer (1968) lists the population at 20,000-50,000 but more recent estimates of population size are: greater than 100,000 (Hofman et al., 1973) and 220,000 (Gilbert, 1974).

Laws (1972) states that only 23 Ross seals have been killed or captured in the Antarctic Treaty area from 1964 to 1969, and that clearly there is at present no serious direct threat to these animals.

The Ross seals account for 1.0-2.0% of the total Antarctic pinniped population (Hofman, et al., 1973).

General Biology:

Species Statistics.—The adults reach a length of about 2.4 m. The animal is plump, with a short, wide head, a small mouth, and small teeth. The vocalizations of this mammal are striking and account for the common name "singing seal."

Reproductive Data.—Little is known of its reproduction, and newborn pups have never been seen. The male matures at 3-4 years, and the female at 2-7 years. Breeding probably takes place in November, and available evidence indicates that the pups are born about 11 months after implantation.

Age-Growth Data.—Molting probably occurs in January and February. These animals may live up to 12 years.

Feeding Habits.—Food consists primarily of fish, cephalopods, and krill.

Parasites and Diseases.—Roundworms are found in the stomach, tapeworms in the intestine, and lice on the skin.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—The University of Minnesota is studying the population dynamics of Antarctic seals.

REFERENCES

- Eklund, D., and E. A. Atwood. 1962. A population study of Antarctic seals. *J. Mammal.* 43:229-238.
- Erickson, Albert W., and Robert J. Hofman. 1974. Antarctic Seals. In Antarctic mammals, Antarctic map folio series, Folio 18, Amer. Geogr. Soc., pp. 4-13.
- Erickson, A. W., D. B. Siniff, D. R. Cline, and R. J. Hofman. 1971. Distributional ecology of Antarctic seals. P. 55-75. In Symposium on Antarctic Ice and Water Masses, Tokyo, Japan, 19 Sept. 1970, Sir George Deacon (ed.).
- Gilbert, J. R. 1974. The biology and distribution of seals in Antarctic pack ice. Ph.D. Dissertation, University of Idaho.
- Hofman, R. A., Erickson, and D. Siniff. 1973. The Ross seal (*Ommatophoca rossi*). IUCN, Survival Service Commission, IUCN Pub. New. Serv., Supple. Pap. No. 39:129-139.
- King, J. E. 1964. Seals of the world. Brit. Mus. (Nat. Hist.), London, 154 p.
- Laws, R. M. 1964. Comparative biology of Antarctic seals. P. 445-457. In Carrick, R., M. Holdgate, and J. Prevost (eds.), *Biologie Antarctique-Antarctic Biology*, Hermann, Paris.
- Laws, R. M. 1972. Seals and birds killed and captured in the Antarctic Treaty area, 1964-69. *The Polar Record*, 16(101):343-364.
- Oritsland, T. 1970. Biology and population dynamics of Antarctic seals. P. 361-366. In Holdgate, M. W. (ed.), *Antarctic ecology*, 1.
- Scheffer, V. B. 1958. Seals, sea lions, and walrus; a review of the Pinnipedia. Stanford Univ. Press, 179 p. + 32 pls.
- Best, P. B. 1970. Exploitation and recovery of right whales *Eubalaena australis* off the Cape Province. *S. Afr. Div. Sea Fish., Invest. Rep.* 80:1-20.
- Cummings, W. C., J. F. Fish, and P. O. Thompson. 1972. Sound production and other behavior of southern right whales, *Eubalaena glacialis*. *Trans. San Diego Soc. Nat. Hist.* 17(1):1-13.
- Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic, 1974/75. Unpublished report submitted to Scientific Committee, International Whaling Commission.
- Omura, H., S. Ohsumi, T. Nemoto, K. Nasu, and T. Kasuya. 1969. Black right whales in the North Pacific Sci. Rep. Whales Res. Inst. 21:1-78.
- Wada, S. 1975. Indices of abundance of large-sized whales in the North Pacific in 1974 whaling season. Unpublished report submitted to Scientific Committee, International Whaling Commission.

BLACK RIGHT WHALE

(*Balaena glacialis*)

Distribution and Migration.—This right whale inhabits all temperate waters of the world. It migrates between summering grounds in cool temperate waters and wintering grounds in warm temperate waters; the wintering grounds are mostly along continental coasts or around islands.

Three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere.

In the eastern North Pacific Ocean, the right whale ranges from Bristol Bay and the Gulf of Alaska south to 50°N latitude during the summer, and from Oregon south to central Baja California during the winter.

In the western North Atlantic Ocean, it ranges from Labrador south to the Bay of Fundy during the summer, and Massachusetts south to Florida and Bermuda during the winter.

Abundance and Trends.—The right whale was originally very abundant, but heavy exploitation, mostly during the 19th century, reduced all populations

nearly to extinction by the turn of the century. At least some local stocks have increased in recent years. Present numbers are: North Pacific Ocean—about 220 (Wada, 1975). North Atlantic Ocean—no estimate; Southern Hemisphere—about 3,200 (Masaki, 1975).

General Biology.—The black right whale is a heavy-bodied animal up to 18.0 m long and is characterized by lack of a dorsal fin and by a large head with a narrow arched rostrum. It feeds mainly on copepods. The reproductive biology is poorly known. Body length at sexual maturity is about 15.2 m in males and 15.8 m in females. Mating and calving occur in the winter, so the gestation period is probably about 1 year. The female probably bears a calf only once every 2 (or more) years.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—Research on the black right whale is being carried out by the South African Division of Sea Fisheries and off Argentina by a joint project of the National Geographic Society and the New York Zoological Society. Observers aboard whaling and research vessels record sightings of right whales and routinely report them to the International Whaling Commission.

REFERENCES

- Best, P. B. 1970. Exploitation and recovery of right whales *Eubalaena australis* off the Cape Province. *S. Afr. Div. Sea Fish., Invest. Rep.* 80:1-20.
- Cummings, W. C., J. F. Fish, and P. O. Thompson. 1972. Sound production and other behavior of southern right whales, *Eubalaena glacialis*. *Trans. San Diego Soc. Nat. Hist.* 17(1):1-13.
- Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic, 1974/75. Unpublished report submitted to Scientific Committee, International Whaling Commission.
- Omura, H., S. Ohsumi, T. Nemoto, K. Nasu, and T. Kasuya. 1969. Black right whales in the North Pacific Sci. Rep. Whales Res. Inst. 21:1-78.
- Wada, S. 1975. Indices of abundance of large-sized whales in the North Pacific in 1974 whaling season. Unpublished report submitted to Scientific Committee, International Whaling Commission.

BOWHEAD WHALE

(*Balaena mysticetus*)

Distribution and Migration.—The bowhead whale inhabits arctic and subarctic waters in four principal areas: (1) from Spitzbergen west to east Greenland; (2) in Davis Strait, Baffin Bay, James Bay, and adjacent waters; (3) in the Bering, Chukchi, Beaufort, and East Siberian Seas; and (4) in the Okhotsk Sea. They migrate with ice movements.

Abundance and Trends.—All bowhead whale populations were decimated by the end of the 19th century because of the great value of this species for oil and baleen (Tomilin, 1957). No commercial whaling for bowheads has taken place since about 1915. Bowhead whales have been completely protected from commercial whaling by the International Convention for the Regulation of Whaling since 1947, and, subsequently, by the Marine Mammal Protection Act of 1972

and the Endangered Species Act of 1973. These acts allow for a subsistence harvest of these whales by the Indians, Aleuts, and Eskimos. In the last two decades the take of bowhead whales by Eskimos in Alaska has varied between 1 (1959) and 37 (1972) (Maher and Wilmovsky, 1963; Durham, unpublished records). Much of this variation in take is because of variation in hunting conditions, although in recent years an increase in hunting intensity may have taken place. Bowhead whales are taken only occasionally by USSR nationals (Zemsky, 1973, pers. comm.). The bowhead whale population of Canada and the Bering, Chukchi, and East Siberian Seas appears to be increasing (Mansfield, 1971; Burns, pers. comm.). The stocks in the Spitzbergen area and the Okhotsk Sea are nearly extinct, but there have been a few sightings in these areas in recent years.

General Biology:

Species Statistics.—The bowhead whale grows to 18 m in length. The color is generally black or dark or dark gray, marked by some white, generally on the chin but sometimes also on the belly.

Reproductive Data.—Sexual maturity is reached at 11.6 m and 12.2 m in males and females, respectively. Mating probably occurs in early April or earlier. Gestation lasts 12-13 months, with a single calf (3-4.5 m long) born in April-May. The reproductive cycle is apparently 2 years long.

Age-Growth Data.—The calf is weaned at 6 months. Yearlings are from 6.7 to 7.9 m long. These whales travel singly, in pairs or threes during the spring. In autumn they are generally scattered, but may occur in groups of up to 50.

Feeding Habits.—The species feeds mainly on euphausiids and other krill, but occasionally on bottom-dwelling invertebrates.

Parasites and Diseases.—Bowhead whales appear to be remarkably free of external and internal parasites.

Ecological Problems.—The north-slope oil project might alter the inshore southward migration should fall steamer and barge traffic increase to force the whales farther offshore.

Allocation Problems.—Some conflict of interest may exist between people who would like complete protection for bowhead whales and Eskimos who hunt these whales.

Current Research.—The National Marine Fisheries Service contracted with the University of Southern California to gather biological data on bowhead whales in 1973. In the spring of 1973 a group of scientists from U.S. and Canadian universities attempted to record underwater sounds of the bowhead whale. The Fisheries Research Board of Canada makes annual surveys from planes of bowhead whales in Canadian waters. In the spring of 1974 the National Marine Fisheries Service re-instituted a research program on bowhead whales.

REFERENCES

- Breumner, Fred. 1971. Whalers of the North. Beaver, 302(3):44-45.

- Davidson, Art. No date. Eskimo hunting of bowhead whales. Rural Alaska Census Action Program. Anchorage AK 37 p.
- Fiscus, Clifford H., and William M. Marquette. 1975. National Marine Fisheries Service field studies relating to the bowhead whale harvest in Alaska, 1974. National Marine Fisheries Service, Northwest Fisheries Center, Seattle, Washington, 98112, 23 pp. (Processed.)
- Mansfield, A. W. 1971. Occurrence of the bowhead or Greenland right whale (*Balaena mysticetus*) in Canadian arctic waters. J. Fish. Res. Bd. Can. 28:1873-1875.
- Mansfield, A. W., D. E. Sergeant, and T. G. Smith. 1975. Marine mammal research in the Canadian Arctic. Dept. of the Environ., Fish. and Mar. Serv., Tech. Rep. No. 507:23 pp.
- Maier, W. J., and N. J. Willimovsky. 1963. Annual catch of bowhead whales by Eskimos at Pt. Barrow, Alaska, 1928-1960. J. Mammal. 44:16-20.
- Ross, W. G. 1974. Distribution, migration, and depletion of bowhead whales in Hudson Bay, 1860-1915. Arct. Alp. Res. 6(1): 85-98.
- Scammon, C. M. 1874. Marine mammals of the northwestern coast of North America: together with an account of the American whale fishery. J. H. Carmany and Co., San Francisco, 319 p.
- Sonnefeld, J. 1960. Changes in an Eskimo hunting technology, an introduction to implement geography. Ass. Amer. Geogr. Ann. 50(2):172.
- Tomlin, A. G. 1957. Zverii SSSR i prilozhishchikh stran. Tom 9. Kitobraznye. (Mammals of the USSR and adjacent countries. Vol. IX Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxi plus 717 p.)

GRAY WHALE

(Eschrichtius robustus)

Distribution and Migration.—The gray whale is now restricted to the North Pacific Ocean, although it once occurred in the North Atlantic Ocean.

Two geographically isolated populations are recognized: (1) the eastern Pacific ("California") stock, which spends the summer in the Chukchi, western Beaufort, and northern Bering Seas (and rarely along the coast as far south as central California), and migrates to the west coast of Baja California and the southern Gulf of California for the winter; and (2) the western Pacific Ocean ("Korean") stock, which spends the summer in the northern Sea of Okhotsk and migrates to the southern coast of Korea for the winter.

Abundance and Trends.—Eastern North Pacific Ocean—contrary to earlier published estimates, the original population was almost certainly less than 15,000 (Henderson, 1972). During the late 18th and earlier 19th centuries the population was greatly reduced. Since complete protection was given the stock in 1947, the population has increased to about 11,000 and has remained stable since 1967 (Rice and Wolman, 1971). An average of about 160 gray whales are killed each year in a subsistence fishery on the Chukotski Peninsula of Siberia. In Alaska, no more than 5 per year have been taken by Eskimos in recent years.

Western North Pacific Ocean—in 1910, the population probably numbered between 1,000 and 1,500. The status of this

population is uncertain at the present time, but it appears to be nearly extinct.

General Biology.—The gray whale is identified by its mottled gray color and low hump in place of a dorsal fin. It feeds on benthic amphipods and other benthic invertebrates on the summering grounds, and fasts during migrations and on wintering grounds. Sexual maturity is attained at an age of 5 to 11 years, at a mean body length of 11.0 m for males and 11.3 m for females. The mating season is in late November and early December while the animals are on their southward migration. The calf is born following a 13-month gestation period after the pregnant females have arrived in certain shallow lagoons on the west coast of Baja California. The female bears a calf only once every 2 or more years. The calves average about 5.0 m long at birth and are weaned 7 months later when they are about 8.0 m long.

Ecological Problems.—The gray whale is now valuable as a tourist attraction, and it supports a rapidly increasing cruise-boat industry, including 1/2-day cruises off San Diego and Los Angeles, and week-long cruises from these ports to Scammon's Lagoon.

These activities have generated a problem of increasing harassment of the whales. In 1972, the Mexican Government declared Scammon's Lagoon a whale refuge, so the activities of the cruise boats are now partly regulated.

Allocation problems.—None known.

Current Research.—Studies on gray whales are being conducted by the National Marine Fisheries Service and the Soviet Union's Far Eastern Institute of Marine Fisheries and Oceanography.

REFERENCES

- Evans, W. E. (ed.). 1974. The California gray whale. Mar. Fish. Rev., 36(4):1-64.
- Henderson, D. A. 1972. Men and whales at Scammon's Lagoon. Dawson's Book Shop, Los Angeles, 313 p.
- Rice, D. W., and A. A. Wolman. 1971. Life history and ecology of the gray whale (*Eschrichtius robustus*). Amer. Soc. Mammal. Spec. Publ. 3:1-142.
- Wolman, A. A., and A. J. Wilson, Jr. 1970. Occurrence of pesticides in whales. Pest. Monit. J., 4(1):8-10.

MINKE WHALE

(Balaenoptera acutorostrata)

Distribution and Migration.—The minke whale inhabits all oceans of the world, except in equatorial regions, and ranges into the polar pack ice zones in the Northern and Southern Hemispheres. It makes extensive seasonal migrations between high-latitude summering grounds and low-latitude wintering grounds.

At least three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. The affinities of the minke whale stocks in the northern Indian Ocean are unknown.

In the eastern North Pacific Ocean, the minke whale ranges from the Chukchi Sea south to northern Baja California during the summer, and from

central California south to within degrees of the equator during the winter.

In the western North Atlantic Ocean it ranges from Baffin Bay south to Chesapeake Bay during the summer, from the eastern Gulf of Mexico to northeastern Florida south at least to Bahamas during the winter.

Abundance and Trends.—The exploitable population in the Southern Hemisphere originally numbered about 122 thousand, and currently numbers at 122 thousand. For the North Atlantic there is no estimate of the original population, but the present population about 80 thousand. No estimates available for the North Pacific.

The minke whale has long been an important species in the "small whale" fisheries of the world. In 1974, catches were over 10,875, distributed as follows:

North Atlantic	1.
Japan	1.
Korea	1.
Brazil	1.
West Africa	1.
South Africa	1.
Antarctic	7.

¹ No data.

General Biology.—The minke whale is the smallest member of the genus *Balaenoptera*, not exceeding 10 m in length in the Northern Hemisphere. The northern animals are distinguished by a white band on the flipper; individuals from the Southern Hemisphere average about 1 meter longer, and usually lack the white flipper band. The minke whale feeds mainly on euphausiids, but also takes some small fishes. In the Northern Hemisphere, it attains sexual maturity at age of 7 to 8 years and an average body length of 7.0 m in males and 7.9 m in females. The female bears a calf once every 2 years (rather than annually as once believed). During the summer pregnant females migrate to much higher latitudes than do the lactating and immature females.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—Research on minke whales is being conducted by the Japanese Far Seas Fisheries Research Laboratory, the South African Division of Sea Fisheries, and the Norwegian State Institute for Whale Research.

REFERENCES

- Jonsgard, A. 1951. Studies on the little pilot whale or minke whale (*Balaenoptera acutorostrata*, Lacepede). Norsk Hvalfangst-Tid. 40(5): 209-232.
- 1962. Population studies on the minke whale, *Balaenoptera acutorostrata* Lacepede, p. 158-167. In LeCren, E. D., and M. Holdgate (eds.), The exploitation of natural animal populations. Blackwell, Oxford.
- Mitchell, E., and V. M. Kozicki. 1975. Supplementary information on minke whale (*Balaenoptera acutorostrata*) from Newfoundland fishery. J. Fish. Res. Bd. C 32: 985-994.
- Ohsumi, S., and Y. Masaki. 1975. Biological parameters of the Antarctic minke whale at the virgin population level. J. Fish. Res. Bd. Can. 32: 995-1004.

- Y. Masaki, and A. Kawamura. 1963. The Antarctic minke whale. *Rep. Whales Res. Inst.* 22: 75-126.
- M. and H. Sakurai. 1956. Studies on the little piked whale from the coast of Japan. *Sci. Rep. Whales Res. Inst.* 11: 1-39.
- Sergeant, D. 1963. Minke whales, *Balaenoptera acutorostrata* Lacepede, of the western North Atlantic. *J. Fish. Res. Bd. Can.* 20: 1489-1504.
- Williamson, G. R. 1975. Minke whales off Brazil. *Sci. Rep. Whales Res. Inst.* 27: 37-59.

BRYDE'S WHALE

(Balaenoptera edeni)

Distribution and Migration.—The Bryde's whale is found in tropical and warm temperate coastal waters around the world. In the western Atlantic Ocean, it ranges from the Gulf of Mexico south to Cabo Frio, Brazil, and in the eastern Atlantic Ocean from Morocco south to the Cape of Good Hope. In the Indian Ocean, it ranges from the Cape of Good Hope north to the Persian Gulf, east to the Gulf of Martaban, Burma, and thence south to Shark Bay, Western Australia. In the western Pacific Ocean, it is distributed from northern Hokkaido, Japan, south to Victoria, Australia, and North Island, New Zealand, in the eastern Pacific Ocean, it ranges from central Baja California, Mexico, south to Iquique, Chile.

At least some of the temperate zone populations (Japan, South Africa) make limited seasonal migrations. The tropical populations may be sedentary.

Abundance and Trends.—The population in the western Pacific, north of 30° lat., numbers between 20,000 and 30,000, and has not yet been significantly reduced by whaling (Ohsumi, 1974). No estimates are available of population sizes elsewhere in the world. The Bryde's whale has been of minor importance in the modern whaling industry. Until recently, only a few of these animals were taken by shore stations in Japan, South Africa, and rarely elsewhere. Since 1970, however, increasing numbers have been harvested by pelagic expeditions in the western North Pacific Ocean, as these expeditions have shifted operations more to the south.

In 1974, 1,363 were killed there—1,176 by Japanese and Soviet pelagic expeditions, and 187 by Japanese shore stations. The only ones reported taken in the Southern Hemisphere were nine taken by the shore station at Durban, South Africa. However, it is believed that most of the 449 "sei" whales taken by the combination catcher-boat/factory-ship *Sierra* (registered in Somalia) off Angola were actually Bryde's whales.

General Biology.—The Bryde's whale is very similar in appearance to the sei whale, and the two species were formerly confused. The Bryde's whale is slightly smaller—usually less than 13.5 m long; its throat grooves extend posteriorly beyond the umbilicus, and it has a pair of

lateral ridges on top of its snout, one on each side of the median ridge. The fringe on its baleen plates is much coarser than that of the sei whale. It feeds mainly on small schooling fishes, and also takes some euphausiids and other crustaceans. Males attain sexual maturity at an average length of 12.2 m and females at 12.5 m. The mating and calving season is usually during the winter, but in some areas—South Africa, for example, they breed year-round. The gestation period is about 1 year. The female does not bear a calf 2 years in succession.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—Research on the Bryde's whale is being conducted by the South African Division of Sea Fisheries and the Japanese Far Seas Fisheries Research Laboratory.

REFERENCES

- Mead, J. G. 1974. Record of sei and Bryde's whale from the Atlantic coast of the United States, the Gulf of Mexico, and the Caribbean. Unpublished report submitted to Scientific Committee, International Whaling Commission.
- Ohsumi, S. 1974. Bryde's whale in the pelagic whaling ground of the North Pacific. Unpublished report submitted to Scientific Committee, International Whaling Commission.
- Ohsumi, S., Y. Shimadzu, and T. Doi. 1971. The seventh memorandum on the results of Japanese stock assessment of whales in the North Pacific. *Rep. Int. Comm. Whaling*, 21: 76-89.
- Omura, H. 1959. Bryde's whale from the coast of Japan. *Sci. Rep. Whales Res. Inst.* 14: 1-33.
- 1962. Further information on Bryde's whale from the coast of Japan. *Sci. Rep. Whales Res. Inst.* 16: 7-18.
- 1966. Bryde's whale in the northwest Pacific, p. 70-78. In K. S. Norris (editor), *Whales, dolphins, and porpoises*. Univ. of California Press, Berkeley and Los Angeles.

SEI WHALE

(Balaenoptera borealis)

Distribution and Migration.—The sei whale is nearly worldwide in distribution. In the eastern North Pacific, it summers from California to the Gulf of Alaska and Aleutian Islands; in the North Atlantic, from New England and the British Isles to the Arctic Ocean. It winters at low altitudes. In the Southern Hemisphere this species summers in all oceans from 30°S latitude southward, and in winter it is generally found north of 40°S latitude.

Abundance and Trends.—Information in this section is from the annual reports of the International Whaling Commission and from recent reports of the Bureau of International Whaling Statistics. The number of sexually mature animals originally numbered about 204 thousand (excluding the North Atlantic, for which no estimates are available), and has now been reduced to about 98 thousand, distributed in major ocean areas as follows:

Ocean	Original population	Current population
North Atlantic	(1)	2,000
North Pacific	42,000	9,000
Southern Ocean	162,000	80,000

¹ No data.

Inclusion of sexually immature whales would increase these estimates by roughly 50 percent. The sei whale is the second most valuable baleen whale, and populations appear to be near the level of maximum sustainable yield. Catches of sei whales in recent seasons have been:

Season	North Pacific	North Atlantic	Southern oceans (south of 40° S.) ^{1,2}	Southern land stations
1969	5,156	222	5,857	1,824
1970	4,504	551	6,153	138
1971	2,993	475	5,452	446
1972	2,327	315	3,864	9
1973	1,856	139	4,392	30
1974	1,280	49	3,859	17

¹ Southern oceans catches are for the seasons 1969-70, 1970-71, 1971-72, 1972-73, respectively.

² Does not include 490 taken in South Atlantic Ocean by a pirate combined catcher/factory vessel.

³ No information from Brazil and Chile in 1969.

⁴ No data from Spain, Azores, or Madeira.

⁵ No data from Chile.

General Biology.—The species resembles the fin whale but is slightly smaller, with less white underneath, and a large dorsal fin. In the far north of the northern hemisphere it feeds mostly on copepods. The diet is much more varied in lower latitudes—including euphausiids, copepods, sauries, anchovies, herring, sardines, and jack mackerel. Sei whales usually travel in small pods of 2-5. They attain sexual maturity at 6-12 years of age, at a body length of about 13.1 m (males) and 13.7 m (females). Females bear calves every 2 or 3 years. The mating and calving season occurs in winter in the respective hemispheres. Gestation lasts 1 year, and the calf is weaned when about 7 months old.

Seven percent of the sei whales taken off California have been infected with a unique disease that causes progressive shedding of the baleen plates and their replacement by an abnormal papilloma-like growth.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—The National Marine Fisheries Service is conducting population and biological studies of this species. Other organizations carrying out research on this species are the Japanese Whale Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic), Fisheries Research Board of Canada (North Atlantic), Norwegian State Institute for Whale Research (Arctic), South African Division of Sea Fisheries (South Africa), and Soviet All-Union Research Institute of Marine Fisheries and Oceanography.

REFERENCES

- Bannister, J. L., and R. Gambell. 1966. The succession and abundance of fin, sei, and other whales off Durban Norak Hvalfangst Tid., 64(3):45-60.
- Gambell, R. 1968. Seasonal cycles and reproduction in sei whales of the Southern Hemisphere. Disc. Rep. 35:31-134.
- International Commission on Whaling. 1973. Twenty-third report of the Commission.
1972. Twenty-second report of the Commission.
- Klumov, S. K. 1961. Plankton and the feeding of the whalebone whales (*Mystacoceti*). Gelken Tsushin, 129(1962):1-12.
- Matthews, L. H. 1938. The sei whale, *Balaenoptera borealis*. Disc. Rep. 17:183-290.
- Omura, H., and T. Nemoto. 1955. Sei whales in the adjacent waters of Japan. Sci. Rep. Whales Res. Inst. 10:79-87.

BLUE WHALE

(Balaenoptera musculus)

Distribution and Migration.—The blue whale is found throughout all oceans from the equator to the polar pack ice zones in the Northern and Southern Hemispheres. It makes seasonal migrations between rather restricted high-latitude summering grounds and low-latitude wintering grounds.

At least three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. Each population is probably comprised of several more or less discrete stocks. The "pygmy blue whale" of the southern Indian Ocean is morphologically distinct from the stocks which spend the summer in Antarctic waters. The affinities of the blue whale populations in the Arabian Sea and Bay of Bengal are unknown.

In the eastern North Pacific Ocean, blue whales range from the Aleutian Islands and Gulf of Alaska south to central California during the summer, and from central Baja California south to within 8 degrees of the equator during the winter.

In the western North Atlantic Ocean, they range from Davis Strait south to the Gulf of St. Lawrence during the summer and spend the winter in the waters east of the West Indies.

Abundance and Trends.—During the first half of the 20th century, the blue whale was one of the most important cetaceans to the whaling industry, but it is now so rare that it will require probably half a century of complete protection to restore the stocks to a significant level. In the North Pacific Ocean the population, which once numbered about 5,000, now contains about 1,700 individuals (Wada, 1975). This species apparently has been slowly increasing since 1966, the year it was first given complete protection.

The population in the western North Atlantic (off eastern Canada), which originally numbered about 1,100 (Allen, 1970), now numbers only a few hundred. Estimates of the eastern North Atlantic population have not been made.

The Southern Hemisphere population originally numbered about 200,000 (Chapman, Allen, and Holt, 1964) but

was severely depleted before complete protection was given the stock in 1965. The present population is estimated at about 9,000, half of which are pygmy blue whales (Masaki, 1975).

General Biology.—The blue whale is the largest mammal that ever lived on earth, reaching a known length of 29 m and a weight of 136 tons. It is distinguished from the fin whale by its mottled blue-gray color dorsally and ventrally, its smaller dorsal fin, its broad flat snout, and its back baleen plates. Blue whales feed exclusively on euphausiids during the summer and fast during the winter. They become sexually mature at an average age of about 10 years, when males of the Antarctic stocks averages 22.5 m and females 24.0 m; whereas the "pygmy blue whales" of the southern Indian Ocean average about 2 m less in length. Every 2 or 3 years during the winter the winter months the female gives birth to a calf after a 12-month gestation period. At birth the calf is about 7 m long; when weaned 8 months later it is about 15 m long.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—Observers aboard whaling and research vessels record sightings of blue whales and routinely report them to the International Whaling Commission.

REFERENCES

- Allen, K. R. 1970. A note on baleen whale stocks of the northwest Atlantic. Rep. Int. Comm. Whaling, 20:112-113.
- Chapman, D. G., K. R. Allen, and S. J. Holt. 1964. Reports of the Committee of Three Scientists on the special scientific investigation of the Antarctic whale stocks. Rep. Int. Comm. Whaling, 14:32-106.
- Gulland, John. 1972. Future of the blue whale. New Scientist, 27 April, p. 198-199.
- Jonsgard, A. 1955. The stocks of blue whales (*Balaenoptera musculus*) in the North Atlantic Ocean and adjacent Arctic waters. Norsk Hvalfangst-Tid. 44(9):505-519.
- Mackintosh, N. A., and J. P. G. Wheeler. 1929. Southern blue and fin whales. Disc. Rep. 1:257-540, 15 pls, 157 figs.
- Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic, 1974/75. Unpublished report submitted to Scientific Committee, International Whaling Commission.
- Ohsumi, S., and S. Wada. 1972. Stock assessment of blue whales in the North Pacific. Unpublished report submitted to Scientific Committee, International Whaling Commission.
- Wada, S. 1975. Indices of abundance of large-sized whales in the North Pacific in 1974 whaling season. Unpublished report submitted to Scientific Committee, International Whaling Commission.

FIN WHALE

(Balaenoptera physalus)

Distribution and Migration.—The fin whale is worldwide in distribution. In the eastern North Pacific it summers from California into the Chukchi Sea, and in the North Atlantic from Cape Cod and Spain into the Arctic Ocean. The fin whale migrates to more southern latitudes in winter. In the Southern Hemisphere it is generally found at latitude

47°-60° south in summer and from 24°-40° south in winter.

Abundance and Trends.—Information in this section is from the annual report of the International Whaling Commission and from the report of the Bureau of International Whaling Statist Sandefjord. The stocks available for commercial harvest originally numbered about 470 thousand, but have now been reduced to about 107 thousand. They are distributed by major ocean areas follows:

Ocean	Original population	Current population
North Atlantic	25,000	10,000
North Pacific	44,000	17,000
Southern Ocean	400,000	80,000

Inclusion of immature whales short of the legal length limit would increase these estimates by roughly 50 percent. Recent catches from the stocks have been:

Season	North Pacific	North Atlantic	Southern oceans ¹	Southern land stations
1969	1,276	800	1,002	
1970	1,012	911	2,890	
1971	802	663	2,663	
1972	758	538	1,761	
1973	460	342	1,286	
1974	413	285	979	

¹ Southern ocean catches are for the seasons 1969-1974 through 1974-75.

² No information from Brazil and Chile.

³ No data from Spain, Azores, or Madeira.

The fin whale is commercially the most valuable baleen whale. Stocks in the North Pacific and southern oceans are below maximum sustainable yield level.

General Biology.—This species is second in size only to the blue whale; in the Northern Hemisphere it grows to at least 23.2 m and is distinguished by gray back, white belly, and well-developed dorsal fin. Fin whales feed mostly on euphausiids, but often eat fish—especially anchovies in the North Pacific and capelin in the North Atlantic.

They usually travel in small pods of 2 to 5 animals. Fin whales are sexually mature at 6-12 years, and at a body length of about 17.7 m (males) and 18.0 m (females). Females bear calves every 2 to 3 years. The mating and calving season occurs in winter in respective hemispheres. Gestation lasts 1 year and the calf is weaned at about age 7 months.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—The National Marine Fisheries Service is conducting population and biological studies of this species. Other organizations carrying out research on this species are the Japanese Whales Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic), Fisheries Research Board of Canada (North Atlantic), British National Institute of Oceanography (South Africa and Antarctic), South African Division of Sea Fisheries (South Africa), and Soviet All-

Union Research Institute of Marine Fisheries and Oceanography (North Pacific and Antarctic).

REFERENCES

- International Commission on Whaling 1973. Twenty-third report of the Commission. — 1972. Twenty-second report of the Commission.
- Jonsgard, A. 1966. Biology of the North Atlantic fin whale *Balaenoptera physalus* (L.): taxonomy, distribution, migration and food. Hvalradets Skr. 49:1-62.
- Laws, R. M. 1961. Reproduction, growth and age of southern fin whales. Disc. Rep. 31:327-486.
- Mackintosh, N. A., and J. F. G. Wheeler. 1929. Southern blue and fin whales. Disc. Rep. 1:257-540.
- Mitchell, Edward. 1975. Present status of Northwest Atlantic fin and other whale stocks, pp. 108-169. In W. E. Schevill (editor) *The Whale Problem*. Harvard Univ. Press, Cambridge, Mass.
- Ohsumi, S., M. Nishiwaki, and T. Hibiya. 1958. Growth of fin whale in the northern Pacific. Sci. Rep. Whales Res. Inst. 13:97-133.

HUMPBAC WHALE

(*Megaptera novaeangliae*)

Distribution and Migration.—The humpback whale is found in almost all oceans from tropical waters to the edge of, but not into, the polar pack ice zones in the Northern and Southern Hemispheres. It makes extensive seasonal migrations between higher latitude summering grounds and low-latitude wintering grounds—the latter along continental coasts or around islands.

Three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. Each population is comprised of several almost entirely discrete stocks.

In the eastern North Pacific Ocean, the humpback whale ranges from the Chukchi Sea south to southern California during the summer, and from southern California south to the Islas Revillagigedo and Jalisco, Mexico, and also around the Hawaiian Islands, during the winter.

In the western North Atlantic Ocean it ranges from Disco Bay in western Greenland south to Massachusetts during the summer, and from Hispaniola and Puerto Rico south to Trinidad during the winter.

Abundance and Trends.—The humpback whale was important, especially to shore stations, during the first half of the 20th century. Now, however, this mammal is so scarce that it will require a half century of complete protection for it to increase to a significant level. A few are killed in subsistence fisheries in Greenland, the Lesser Antilles, and the Tonga Islands. It has a minor value as a tourist attraction in Hawaii and southeastern Alaska. The original population size of the North Pacific Ocean is unknown, but is now severely depleted to about 2,500 individuals (Wada, 1975). A summer resident population of about 60 animals occupies the inside waters of Southeastern Alaska. The population has

apparently not increased since complete protection was given the species in 1966.

The original population size of the North Atlantic Ocean is unknown and the western North Atlantic Ocean stock is now reduced to about 1,000 animals (Winn, Edel, and Taruski, 1975). A small increase may have occurred in recent years. Estimates of the eastern North Atlantic Ocean population have not been made.

The original population of the Southern Hemisphere, which probably numbered about 100,000, now contains about 2,500 individuals (Masaki, 1975). The stock has apparently not increased since complete protection was given the species in 1964.

General Biology.—The humpback whale is much more heavily bodied than members of the genus *Balaenoptera*, and is characterized by its extremely long flippers. It feeds mainly on euphausiids, but also eats anchovies and sardines when available. The species attains sexual maturity at an age of 6 to 12 years, when males average 11.6 m long and females 11.9 m. The mating and calving season is from October to March in the Northern Hemisphere, and April to September in the Southern Hemisphere. The gestation period is 12 to 13 months and the calf nurses for about 11 months. The female rarely bears a calf 2 years in succession.

The humpback whale is heavily infested with three species of ectocommensal barnacles and with whale lice.

Ecological Problems.—None known.

Allocation Problems.—None at present.

Current Research.—Observers aboard research vessels and foreign whaling ships record sightings of humpback whales and routinely report them to the International Whaling Commission. The National Marine Fisheries Service is conducting research on the summer grounds in southeastern Alaska and the winter grounds around the Hawaiian Islands.

REFERENCES

- Allen, K. R. 1970. A note on baleen whale stocks of the Northwest Atlantic. Rep. Int. Comm. Whaling, 20:112-113.
- Chapman, D. G. In press. Status of research and baleen whale stocks in the Antarctic. Presented at IJP Conference on the Biology of Whales, Luray, Virginia, June 1971.
- Chittleborough, R. G. 1965. Dynamics of two populations of the humpback whale, *Megaptera novaeangliae* (Borowski). Austr. J. Mar. Freshw. Res. 16: 33-128.
- Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic, 1974/75. Unpublished report submitted to Scientific Committee, International Commission.
- Nishiwaki, M. 1959. Humpback whales in Ryukyuan waters. Sci. Rep. Whales Res. Inst. 14:49-87.
- Wada, S. 1975. Indices of abundance of large-sized whales in the North Pacific in 1974 whaling season. Unpublished report submitted to Scientific Committee, International Whaling Commission.
- Winn, H. E., R. K. Edel, and A. G. Taruski. 1975. Population estimate of the humpback whale (*Megaptera novaeangliae*) in the West Indies by visual and acoustic means. J. Fish. Res. Bd. Can. 32:499-506.

ROUGH-TOOTHED DOLPHIN

(*Steno bredanensis*)

Distribution and Migration.—The rough-toothed dolphin inhabits tropical and warm temperate seas. It ranges in the western Atlantic Ocean from Virginia south. In the North Pacific Ocean it ranges north to southern Japan (35° N) where it is rare, and to the Hawaiian Islands where it is fairly common. It is known in the eastern Pacific from standings near San Francisco and in the Galapagos Islands, and from several records in the tropical tuna fishery where it occasionally is captured together with bottlenosed, spotted, and spinner dolphins.

Abundance and Trends.—The rough-toothed dolphin is uncommon but not rare throughout most of its range. It is caught infrequently in the Japanese dolphin fishery (Ohsumi, 1972).

General Biology:

Age-Growth Data.—This dolphin grows to about 2.4 m.

Feeding Habits.—Very little is known about feeding habits of this species. The stomachs of specimens captured in the tuna fishery contained remains of fish and squid.

Ecological Problems.—None known.

Allocation Problems.—Rough-toothed dolphins are occasionally trapped accidentally in commercial fishing gear. In this way, a small number are lost in the eastern Pacific international tuna seine fishery.

Current Research.—The Oceanic Institute in Hawaii is studying this species in the wild and had a *Steno-Tursiops* hybrid in captivity. Specimens retrieved from the incidental kill in the eastern Pacific international tuna fishery are examined at the Southwest Fisheries Center, La Jolla, California.

REFERENCES

- Dohl, T. P., K. S. Norris, and I. King. 1974. A porpoise hybrid: *Tursiops x Steno*. J. Mamm. 55(1):217-221.
- NOAA. 1972. Observation on the status of stocks and a recommended program to reduce the incidental kill of porpoise taken in the eastern tropical Pacific tuna seine fishery. Report of the NOAA Tuna-Porpoise Review Committee, 63 p.
- Norris, K. S., and J. H. Prescott. 1961. Observations on Pacific cetaceans of California and Mexican waters. Univ. of Calif. Publications in Zoology, Univ. of Calif. Press, Berkeley and Los Angeles. 63:4291-402, pl. 27-41, 12 figs. in text.
- Ohsumi, S. 1972. Catch of marine mammals, mainly of small cetaceans by local fisheries along the coast of Japan. Bull. of Far Seas Fish. Res. Lab. No. 7:137-166.
- Perrin, W. F., and W. A. Walker. (In press). The rough-toothed porpoise, *Steno bredanensis*, in the eastern tropical Pacific. J. Mammalogy.
- Pryor, K. W., R. Haag, and J. O'Reilly. 1969. The creative porpoise: training for novel behavior. J. Exp. Anal. Behav. 12(4):653-661.

BOTTLENOSED DOLPHIN

(*Tursiops truncatus*)

Distribution and Migration.—The bottlenosed dolphin is widely distributed in

Union Research Institute of Marine Fisheries and Oceanography (North Pacific and Antarctic).

REFERENCES

- International Commission on Whaling 1973. Twenty-third report of the Commission.
 — 1972. Twenty-second report of the Commission.
 Jonsgard, A. 1966. Biology of the North Atlantic fin whale *Balaenoptera physalus* (L.): taxonomy, distribution, migration and food. Hvalradets Skr. 49:1-62.
 Laws, R. M. 1961. Reproduction, growth and age of southern fin whales. Disc. Rep. 31:327-486.
 Mackintosh, N. A., and J. F. G. Wheeler. 1929. Southern blue and fin whales. Disc. Rep. 1:257-540.
 Mitchell, Edward. 1975. Present status of Northwest Atlantic fin and other whale stocks, pp. 108-169. In W. E. Schevill (editor) *The Whale Problem*. Harvard Univ. Press, Cambridge, Mass.
 Ohsumi, S., M. Nishiwaki, and T. Hibiya. 1958. Growth of fin whale in the northern Pacific. Sci. Rep. Whales Res. Inst. 13:97-133.

HUMPBAC WHALE

(*Megaptera novaeangliae*)

Distribution and Migration.—The humpback whale is found in almost all oceans from tropical waters to the edge of, but not into, the polar pack ice zones in the Northern and Southern Hemispheres. It makes extensive seasonal migrations between higher latitude summering grounds and low-latitude wintering grounds—the latter along continental coasts or around islands.

Three geographically isolated populations are recognized, one in the North Pacific Ocean, another in the North Atlantic Ocean, and a third in the Southern Hemisphere. Each population is comprised of several almost entirely discrete stocks.

In the eastern North Pacific Ocean, the humpback whale ranges from the Chukchi Sea south to southern California during the summer, and from southern California south to the Islas Revillagigedo and Jalisco, Mexico, and also around the Hawaiian Islands, during the winter.

In the western North Atlantic Ocean it ranges from Disco Bay in western Greenland south to Massachusetts during the summer, and from Hispaniola and Puerto Rico south to Trinidad during the winter.

Abundance and Trends.—The humpback whale was important, especially to shore stations, during the first half of the 20th century. Now, however, this mammal is so scarce that it will require a half century of complete protection for it to increase to a significant level. A few are killed in subsistence fisheries in Greenland, the Lesser Antilles, and the Tonga Islands. It has a minor value as a tourist attraction in Hawaii and southeastern Alaska. The original population size of the North Pacific Ocean is unknown, but is now severely depleted to about 2,500 individuals (Wada, 1975). A summer resident population of about 60 animals occupies the inside waters of Southeastern Alaska. The population has

apparently not increased since complete protection was given the species in 1966.

The original population size of the North Atlantic Ocean is unknown and the western North Atlantic Ocean stock is now reduced to about 1,000 animals (Winn, Edel, and Taruski, 1975). A small increase may have occurred in recent years. Estimates of the eastern North Atlantic Ocean population have not been made.

The original population of the Southern Hemisphere, which probably numbered about 100,000, now contains about 2,500 individuals (Masaki, 1975). The stock has apparently not increased since complete protection was given the species in 1964.

General Biology.—The humpback whale is much more heavily bodied than members of the genus *Balaenoptera*, and is characterized by its extremely long flippers. It feeds mainly on euphausiids, but also eats anchovies and sardines when available. The species attains sexual maturity at an age of 6 to 12 years, when males average 11.8 m long and females 11.9 m. The mating and calving season is from October to March in the Northern Hemisphere, and April to September in the Southern Hemisphere. The gestation period is 12 to 13 months and the calf nurses for about 11 months. The female rarely bears a calf 2 years in succession.

The humpback whale is heavily infested with three species of ectocommensal barnacles and with whale lice.

Ecological Problems.—None known.

Allocation Problems.—None at present.

Current Research.—Observers aboard research vessels and foreign whaling ships record sightings of humpback whales and routinely report them to the International Whaling Commission. The National Marine Fisheries Service is conducting research on the summer grounds in southeastern Alaska and the winter grounds around the Hawaiian Islands.

REFERENCES

- Allen, K. R. 1970. A note on baleen whale stocks of the Northwest Atlantic. Rep. Int. Comm. Whaling, 20:112-113.
 Chapman, D. G. In press. Status of research and baleen whale stocks in the Antarctic. Presented at IJP Conference on the Biology of Whales, Luray, Virginia, June 1971.
 Chittleborough, R. G. 1965. Dynamics of two populations of the humpback whale, *Megaptera novaeangliae* (Borowski). Austr. J. Mar. Freshw. Res. 16: 33-128.
 Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic, 1974/75. Unpublished report submitted to Scientific Committee, International Commission.
 Nishiwaki, M. 1959. Humpback whales in Ryukyuan waters. Sci. Rep. Whales Res. Inst. 14:49-87.
 Wada, S. 1975. Indices of abundance of large-sized whales in the North Pacific in 1974 whaling season. Unpublished report submitted to Scientific Committee, International Whaling Commission.
 Winn, H. E., R. K. Edel, and A. G. Taruski. 1975. Population estimate of the humpback whale (*Megaptera novaeangliae*) in the West Indies by visual and acoustic means. J. Fish. Res. Bd. Can. 32:499-506.
 Dohl, T. P., K. S. Norris, and I. King. 1974. A porpoise hybrid: *Tursiops x Steno*. J. Mamm. 55(1):217-221.
 NOAA. 1972. Observation on the status of stocks and a recommended program to reduce the incidental kill of porpoise taken in the eastern tropical Pacific tuna seine fishery. Report of the NOAA Tuna-Porpoise Review Committee, 63 p.
 Norris, K. S., and J. H. Prescott. 1961. Observations on Pacific cetaceans of California and Mexican waters. Univ. of Calif. Publications in Zoology, Univ. of Calif. Press, Berkeley and Los Angeles. 63:4291-402, pl. 27-41, 12 figs. in text.
 Ohsumi, S. 1972. Catch of marine mammals, mainly of small cetaceans by local fisheries along the coast of Japan. Bull. of Far Seas Fish. Res. Lab. No. 7:137-166.
 Perrin, W. F., and W. A. Walker. (In press). The rough-toothed porpoise, *Steno bredanensis*, in the eastern tropical Pacific. J. Mammalogy.
 Pryor, K. W., R. Haag, and J. O'Reilly. 1969. The creative porpoise: training for novel behavior. J. Exp. Anal. Behav. 12(4):653-661.

BOTTLENOSED DOLPHIN

(*Tursiops truncatus*)

Distribution and Migration.—The bottlenosed dolphin is widely distributed in

ROUGH-TOOTHED DOLPHIN

(*Steno bredanensis*)

Distribution and Migration.—The rough-toothed dolphin inhabits tropical and warm temperate seas. It ranges in the western Atlantic Ocean from Virginia south. In the North Pacific Ocean it ranges north to southern Japan (35° N) where it is rare, and to the Hawaiian Islands where it is fairly common. It is known in the eastern Pacific from standings near San Francisco and in the Galapagos Islands, and from several records in the tropical tuna fishery where it occasionally is captured together with bottlenosed, spotted, and spinner dolphins.

Abundance and Trends.—The rough-toothed dolphin is uncommon but not rare throughout most of its range. It is caught infrequently in the Japanese dolphin fishery (Ohsumi, 1972).

General Biology:

Age-Growth Data.—This dolphin grows to about 2.4 m.

Feeding Habits.—Very little is known about feeding habits of this species. The stomachs of specimens captured in the tuna fishery contained remains of fish and squid.

Ecological Problems.—None known.

Allocation Problems.—Rough-toothed dolphins are occasionally trapped accidentally in commercial fishing gear. In this way, a small number are lost in the eastern Pacific international tuna seine fishery.

Current Research.—The Oceanic Institute in Hawaii is studying this species in the wild and had a *Steno-Tursiops* hybrid in captivity. Specimens retrieved from the incidental kill in the eastern Pacific international tuna fishery are examined at the Southwest Fisheries Center, La Jolla, California.

REFERENCES

- Dohl, T. P., K. S. Norris, and I. King. 1974. A porpoise hybrid: *Tursiops x Steno*. J. Mamm. 55(1):217-221.
 NOAA. 1972. Observation on the status of stocks and a recommended program to reduce the incidental kill of porpoise taken in the eastern tropical Pacific tuna seine fishery. Report of the NOAA Tuna-Porpoise Review Committee, 63 p.
 Norris, K. S., and J. H. Prescott. 1961. Observations on Pacific cetaceans of California and Mexican waters. Univ. of Calif. Publications in Zoology, Univ. of Calif. Press, Berkeley and Los Angeles. 63:4291-402, pl. 27-41, 12 figs. in text.
 Ohsumi, S. 1972. Catch of marine mammals, mainly of small cetaceans by local fisheries along the coast of Japan. Bull. of Far Seas Fish. Res. Lab. No. 7:137-166.
 Perrin, W. F., and W. A. Walker. (In press). The rough-toothed porpoise, *Steno bredanensis*, in the eastern tropical Pacific. J. Mammalogy.
 Pryor, K. W., R. Haag, and J. O'Reilly. 1969. The creative porpoise: training for novel behavior. J. Exp. Anal. Behav. 12(4):653-661.

temperate and tropical waters, but strays into much colder latitudes. In the western North Atlantic, it ranges at least as far north as Nova Scotia and southern Greenland but is best known from New England southward to Florida, westward throughout the Gulf of Mexico and thence throughout the West Indies and Caribbean to Venezuela. From about North Carolina northward this species begins to distribute offshore, and southward its members are nearshore, riverine and estuarine with far fewer distributed to the edge of the Continental Shelf. In the eastern Atlantic, it is found from the northeast Scandinavian coast to South Africa. In the eastern north Pacific it infrequently occurs in offshore currents, perhaps as far north as southern Oregon, but is far more common south of Point Conception, where individuals may be encountered primarily within the coastal zone but also less frequently on the continental slope and beyond. The species is probably continuous to central Chile. In the western Pacific, it is found north to Japan and south to Australia and New Zealand. Its Pacific range includes the Hawaiian Islands, where it is said to be common. Nominal species have been named from the tropical Indo-Pacific (*T. aduncus*), and the northern Gulf of California and waters along the west coast of Baja California and southern California (*T. gilli*). The geographical ranges and characters delimiting these named forms are still poorly defined. The Small Cetaceans Subcommittee of the International Whaling Commission, commented on the taxonomy of *Tursiops*, as follows: "The necessary taxonomic work has not yet been done, it seems likely that there is only one species of *Tursiops*, with sharply-defined geographical races varying in body size and tooth size and distributed differentially relative to sea temperature and depth. There is great need to gather materials that will allow definitive examination of the nominal species *T. aduncus*, *T. gilli*, and *T. nuanu*, and materials from as many other populations as possible. These names are currently used by some workers." Subjective impressions and limited data from regional surveys and radio and static tagging programs suggest that populations are localized within about a 100-mile radius and that this species does not make long migrations. Bottlenosed dolphins are often seen in large loose schools of several hundred animals, which appear to consist of aggregations of small groups of no more than a dozen individuals. Humpback and right whales traveling along the Atlantic coast of Florida and pilot whales off the southern California coast are almost always accompanied by bottlenosed dolphins. Gray whales along southern and Baja California are also frequently accompanied by one or more *Tursiops*.

Abundance and Trends.—In 1974-1975 populations from Mobile Bay to western Louisiana alone were estimated from aerial surveys to number 3,500-10,000 animals (Leatherwood and Evans, 1976). Population estimates currently are not available for other areas.

In North Carolina, from 500 to 1,000 animals were killed annually during the early 20th century (Townsend, 1914). A few bottlenosed dolphins are now taken for food in small open-boat pilot whale fisheries in the Lesser Antilles (St. Vincent, St. Lucia, Dominica) and some are harvested by Venezuelan fishermen. In the past, several hundred bottlenosed dolphins have been taken each year off Florida, Mississippi, and Texas for display in marine aquariums and for research. Based on subjective data it is believed that local populations of the southwestern United States are not now being significantly affected by these activities (D.K. Caldwell, pers. comm.).

Small numbers are taken for food off Baja, California, and mainland Mexico, in the nets of tuna fishermen in the eastern tropical Pacific, and for aquarium display in southern California and Hawaii.

General Biology:

Reproductive Data.—Gestation lasts about 1 year, and calves may nurse for 1.5 to 2 years, although they begin to take solid food at age 6 months. Breeding apparently occurs throughout the year, but the fact that most of the young are born during a certain time of year suggests that breeding, as well as calving, takes place in the spring and summer.

Age-Growth Data.—Bottlenosed dolphins are 1.0 m long at birth and grow to 3.6 m in length and 650 kg. in weight. Captive animals have become sexually mature at 6 years, but recent evidence suggests that this species normally breeds at about 12 years. The estimated life span for this species is about 25 years, but it may be longer indicating that natural mortality is low.

Feeding Habits.—Bottlenosed dolphins feed on several species of fish, squid, and a few crustaceans. In many areas they are catholic in their food selection, seasonally capitalizing upon the most abundant or accessible food species. They frequently feed on the by-products of human activity.

Ecological Problems.—None known.

Allocation Problems.—Some fishermen state that bottlenosed dolphins harass fishing efforts by biting fish and shrimp nets and some attempt to drive them away. Bottlenosed dolphins are occasionally trapped accidentally in commercial fishing gear. In this way, a small number are lost in the eastern Pacific international tuna seine fishery. As indicated in the *Tursiops truncatus* Assessment Workshop (Odell, et al., 1975), the effect on the population of taking these animals for display and research off the southeast United States requires further study.

Current Research.—Several agencies and institutions conduct or support research on the bottlenosed dolphin. Included are the Office of Naval Research, National Institutes of Health, and the National Science Foundation. The University of Florida concentrates its research on general life history, intra-species communication, and ecological studies. The U.S. Fish and Wildlife Serv-

ice is conducting similar detailed studies of the life history of the animals near Tampa Bay, Florida. The Florida State Museum is studying systematics. Research in physiology, echolocation, anatomy, life history and the behavior of captive and wild individuals has been done at the Naval Undersea Centers in San Diego and Hawaii. These laboratories are also assessing numbers and viability of regional stocks. Texas A&M University is conducting a detailed population study of Aransas Bay, Texas. Studies on vision are being carried out by scientists from the University of Miami. The Dolfinarium at Hardewijk, Netherlands, has recently conducted studies of the physiology and handling of these animals. Specimens retrieved from the incidental kill in the eastern Pacific international tuna fishery are examined at the Southwest Fisheries Center, where studies are underway on their systematics, distribution, life history, and feeding habits.

REFERENCES

- Anderson, Harold T. (ed.). 1969. The biology of marine mammals. Academic Press, New York, 511 p.
- Caldwell, David K., and Melba C. Caldwell. 1972. The world of the bottlenosed dolphin. J. B. Lippincott Co., Philadelphia, 157 p.
- Leatherwood, Stephen. 1975. Aerial assessment of bottlenosed dolphins off Mississippi and western Louisiana, p. 49-86. In Odell, D. K., D. B. Siniff, and G. H. Waring (ed.). Final report *Tursiops truncatus* assessment Workshop. Univ. Miami Contract Rep. UM-RSMAS-75042.
- Leatherwood, Stephen. 1975. Some observations of feeding behavior of bottlenosed dolphins (*Tursiops truncatus*) in the northern Gulf of Mexico and (*Tursiops* cf. *T. gilli*) off southern California, Baja California, and Nayarit, Mexico. Mar. Fish. Rev. 37(9) 10-16.
- Leatherwood, Stephen, and W. E. Evans. 1976. The bottlenosed dolphin, *Tursiops truncatus*: a synoptic account of the species. In S. H. Ridgway, Sam H. and R. Harrison (ed.). A handbook of marine mammals of the world. New York, Academic Press (in preparation).
- Leatherwood, Stephen, D. K. Caldwell, and H. E. Winn. 1976. Whales, dolphins, and porpoises of the western North Atlantic: a guide to their identification. NOAA Tech. Rep. NMFS circ. (in press).
- Norris, Kenneth S. (ed.). 1966. Whales, dolphins, and porpoises. Univ. California Press, Berkeley, 789 p.
- Odell, D. K., D. B. Siniff, and G. H. Waring (ed.). 1975. Final report *Tursiops truncatus* assessment workshop. Univ. Miami Contract Rep. UM-RSMAS-75041 141 p.
- Ridgway, Sam H. (ed.). 1972. Mammals of the sea: biology and medicine. Charles C. Thomas, Springfield, Ill. 812 p.
- Sergeant, D. E., D. K. Caldwell, and M. C. Caldwell. 1973. Age, growth, and maturity of bottlenosed dolphin (*Tursiops truncatus*) from northeast Florida. J. Fish. Res. Bd. Canada 30(7):1009-1011.

RISSEO'S DOLPHIN

(*Grampus griseus*)

Distribution and Migration.—The Risso's dolphin ranges through all temperate and tropical seas. In western North America its northern limit is British Columbia, and it is sighted dur-

ing the winter in central California. In the eastern United States it ranges from Massachusetts south. Strandings in Britain are most common during the summer. The species probably migrates to higher latitudes in the warmer months.

Abundance and Trends.—Risso's dolphin was described in 1894 as "abundant" near Monterey Bay, California (Daugherty, A. E., 1972). The species is uncommon but not rare throughout most of its range. Over 200 of these animals were sighted in one group during 1972 off the Washington coast (Fiscus, Unpublished field notes, 1972).

General Biology.—Risso's dolphin grows to 3.6 to 4.0 m. Its skin commonly has long, narrow, white marks believed to be scars caused by others of the same species. Solitary animals or schools of 12 or less are generally observed. This species is frolicsome, and sometimes leaps clear of the water. Known foods are almost exclusively cephalopods.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—Studies of distribution and abundance in the eastern Pacific are currently underway by K. S. Norris and a group of co-workers at Univ. of Calif., Santa Cruz, and by J. S. Leatherwood of the Naval Undersea Center, C. S. Hubbs of Scripps Institution of Oceanography and the Southwest Fisheries Center.

REFERENCES

- Daugherty, Anita, E. 1972. Marine mammals of California. State of Calif. Res. Agency, Dept. Fish and Game, 91 pp.
- Orr, R. T. 1966. Risso's dolphin on the Pacific coast of North America. *J. Mammal* 47:341-343.
- Tomlin, A. G. 1957. Zverii SSSR i prilozhashchikh stran. Tom 9. Kitobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Adak. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii plus 717 p.)

WHITE-BEAKED DOLPHIN

(*Lagenorhynchus albirostris*)

Distribution and Migration.—The white-beaked dolphin inhabits the coastal waters of the North Atlantic Ocean from the Barents Sea and Davis Strait to France and Massachusetts. It is most common in the North Sea from the east coast of the United Kingdom to the Faroe Islands, and may winter in the southerly parts of the North Atlantic Ocean. It appears in Davis Strait in the spring and summer after the beluga and narwhal migrate north and leaves in autumn sometimes as late as November. It apparently ranges farther north into Arctic waters than its relative, the white-sided dolphin.

Abundance and Trends.—This species is one of the more abundant of North Atlantic toothed whales. Schools of as many as 1,500 have been reported from the coast of Norway where it is attracted by herring (Fraser, 1949).

Tomlin (1957) reports schools of several hundred and states that this species is taken commercially in Norway, but gives no statistics on the catch. He also mentions that it was once taken

commercially in Davis Strait. Mitchell (1973) summarized a small direct exploitation in Newfoundland.

General Biology.—This gregarious species grows to 3.0 m and matures at 2.0 m or larger; the calves are as long as 1.2 m when born. The mating period is long, but limited to the warmer half of the year. Most of the calves are born during midsummer. Food is mainly fish such as herring, cod, whiting, and capelin, but also crustaceans and mollusks such as hermit crabs, whelks, and squids.

Ecological Problems.—Strandings of schools of up to 30 animals have been reported.

Allocation Problems.—None known.

Current Research.—None.

REFERENCES

- Fraser, F. C. 1949. Whales and dolphins. Part II In J. R. Norman and F. C. Fraser, Field book of giant fishes. P. 201-349, pls. 6-8. G. Putnam's Sons, New York.
- Mitchell, E. 1973. Porpoise, dolphin and small whale fisheries of the world status and problems. Int. Union Conserv. Nat. Resour., Morges Monogr., 3:1-129.
- Morzer Bruyns, Capt. W. F. J. 1971. Field Guide of Whales and Dolphins. Amsterdam, Uitgeverij tot N. V. Uitgeverij v.h.c.a. mees, p. 258.
- Nishiwaki, M. 1972. General Biology Chap. 1. p. 1-204. In: Mammals of the sea, Biology and medicine. Ed. S. H. Ridgway. Charles Thomas, Springfield, Ill.
- Tomlin, A. G. 1957. Zverii SSSR i prilozhashchikh stran. Tom 9. Kitobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Adak. Nauk. SSSR, 756 pp. (Transl. by IPST, Jerusalem, 1967, xxii + 717 pp.)
- Van Bree, P. J. H. 1970. Über Weisschnauzdelphine (*Lagenorhynchus albirostris*) von den deutschen Nordseeküsten. Natur. und Museum 100(8):264-268.

ATLANTIC WHITE-SIDED DOLPHIN

(*Lagenorhynchus acutus*)

Distribution and Migration.—The Atlantic white-sided dolphin ranges the coastal waters of the North Atlantic Ocean from the Barents Sea and Davis Strait south to France and Cape Cod.

Abundance and Trends.—The status of this species is unknown. According to Tomlin (1957), "this dolphin is taken only in summer in the waters of Norway; the animals are trapped in the fjords, which they enter in vast schools pursuing herring. The take may reach 1,500 individuals at a time." It is sometimes taken in association with pilot whales in Newfoundland drive fisheries (Sergeant and Fisher, 1957).

General Biology.—This species grows to 3.0 m. Gestation is 10 months. The young are born mostly in midsummer and are about 1.0 m in length. The age of a 1.5 m animal was estimated at 3 years (Sergeant and Fisher, 1957). It feeds mostly on squid, pelagic and benthopelagic fish such as mackerel, salmonids, and herring, and some crustaceans and mollusks such as *Pagurus* and *Buccinum*. Schools in excess of 1,000 animals have been reported while they were feeding; groups of 10 to 50 are normally seen.

Ecological Problems.—Stranded schools of up to 30 have been reported.

Allocation Problems.—None known.
Current Research.—None.

REFERENCES

- Sergeant, D. E. and H. C. Fisher. 1957. The smaller cetacea of eastern Canadian waters. *J. Fish. Res. Board Can.* 14:83-115.
- Tomlin, A. G. 1957. Zverii SSSR i prilozhashchikh stran. Tom 9. Kitobraznye. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxii + 717 p.)
- Utrecht, W. L. van and A. M. Husson. 1968. Strandings van Cetacea in het Voorjaar van 1967 op de Nederlandse Kusten. *Lutra* 10:7-17, pl. 2-4.

PACIFIC WHITE-SIDED DOLPHIN

(*Lagenorhynchus obliquidens*)

Distribution and Migration.—The Pacific white-sided dolphin ranges the northern North Pacific from the coast of Japan and Baja California northward. It is found year-round off California and Washington and in Alaska and Kurile Islands waters during the summer, but has not been reported from the Bering Sea. It frequents the waters of the continental shelf and slope but on occasion has been sighted in large schools in offshore waters. Small numbers, which are "resident" from Point Conception south to Cedros Island, appear to be morphologically different from northern forms (being larger and more robust). These resident stocks are supplemented in southern California and Baja California by migrants coming south and inshore migrations into Monterey Bay and the central California continental shelf also apparently occur during mid-winter.

Abundance and Trends.—Norris and Prescott (1961) report the species as common off southern California in inshore waters in winter and spring and offshore in summer and fall. According to sighting reports in the files of the National Marine Fisheries Service, Seattle, the University of California, Santa Cruz, and the Naval Undersea Center, San Diego, as reported by Pike and MacAskle (1969), this species may be the most abundant dolphin north of southern California. No estimate of the size of the population along the west coast of North America has been made.

Nishiwaki (1972) estimates the population in Japanese waters to be between 30 and 50 thousand. Klumov (1959) reports that the Pacific white-side dolphin is one of the two most numerous dolphins found in the late summer and fall in the Kurile Islands area, and forms schools of up to several thousand animals.

A few of these animals are taken for display in ocean aquaria.

General Biology.—This species grows to 2.3 m, and weighs up to 181 kg. A male 1.2 m in length with milk in its stomach was taken off Washington. It probably breeds in late spring to autumn, with a gestation period of 10-12 months. Schools of thousands are seen, often together with common and right-whale dolphins and less frequently with *Grampus*. It is active day and night, frolics, follows ships, dashes across ships' bows, and oc-

casional jumps clear of the surface. It adapts well to captivity. This dolphin feeds primarily on cephalopods and small fish such as herring, sardine, anchovy, and saury.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—A study of the natural history and behavior has been funded by the Marine Mammal Commission.

REFERENCES

- Klunov, S. K. 1959. Commercial dolphins of the far east. Pac. Sci. Res. Inst. of Fish. Soc. Oceanogr. (TINRO) Izv. Vol. LXVII. Transl. by L. V. Sagen, 1962.
- Nishiwaki, N. 1972. General Biology. Chap. I pp. 1-204. In Mammals of the seal, biology and Medicine (ed.) S. H. Ridgway.
- Norris, K. S., and J. H. Prescott. 1961. Observations of Pacific cetaceans of California and Mexican waters. U. of Calif. Publ. Zool. 63(4): 291-402.
- Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. Fish. Res. Bd. of Can. Bull. 171, 54 p.
- Scheffer, V. B. 1950. The striped dolphin, *Lagenorhynchus obliquidens* Gill, 1865, on the coast of North America. Am. Midl. Nat. 44: 750-758.
- Tomilin, A. G. 1957. Zverii SSSR i prilozheniya. (Mammals of the USSR and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk. SSSR, 756 p. Transl. by IPST, Jerusalem, 1967, xlii plus 717 p.)

GANGES RIVER DOLPHIN

(*Platanista gangetica*)

Distribution and Migration.—This species (with which the Indus dolphin, *P. minor*, was formerly thought to be identical) is confined to the Ganges-Brahmaputra river system of India and Bangladesh, from tidal limits to the foothills, and the Karnaphuli River, a small river that empties into the Bay of Bengal east of the mouth of the Ganges. During the summer monsoon season, these dolphins extend their distribution up stream into the smaller tributaries; during the winter dry season they retreat into the larger main streams.

Abundance and Trends.—No data are available on population size, but the species is still fairly numerous, and there is no indication that it is currently endangered. A few are captured incidentally in seines by fishermen, who attempt to release the dolphins alive.

General Biology.—Sexual maturity is attained at an average age (estimated from growth layers in the teeth) of 10 years, when females have attained a body length of 170-200 cm, and males a length of 170 cm. Physical maturity is attained at an age of about 20 years, and a body length of 250 cm for females and 200-210 cm for males. Mating is said to occur from July to September, and the single calf, 70-75 cm long, is born between April and July after an apparent gestation period of 8 to 9 months. Such a short gestation period is highly questionable, and Pilleri (1971) suggests evidence for mating in April. The calves are weaned by the beginning of the next winter. The mean interval between successive calves

is at least two years. These dolphins, which are blind, feed on shrimps and mud-frequenting fishes which they apparently catch by probing about in the bottom of the rivers.

Ecological Problems.—None known.

Allocation Problems.—None at present.

Current Research.—Several field studies have recently been made by biologists from the University of Tokyo, the Bangladesh Agricultural University, and the University of Berne.

REFERENCES

- Anderson, J. 1878. A monograph of the two cetacean genera *Platanista* and *Orcella*, pp 355-550. In Anatomical and Zoological Researches, Vol. 1. Bernard Quaritch, London.
- Harrison, R. J. 1972. Reproduction and reproductive organs in *Platanista indii* and *Platanista gangetica*. Cetacea 4: 71-82.
- Kasuya, T. 1972. Some informations on the growth of the Ganges dolphins with a comment on the Indus dolphin. Sci. Rep. Whales Res. Inst. 24: 87-103, plus 3 plates.
- Kasuya, T., and A.K.M.A. Haque. 1972. Some informations on distribution and seasonal movement of the Ganges dolphin. Sci. Rep. Whales Res. Inst. 24: 109-115, plus 1 plate.
- Pilleri, G. 1970. Observations on the behavior of *Platanista gangetica* in the Indus and Brahmaputra rivers. Invest. Cetacea 2: 27-60.
- 1971. Observation on the copulatory behavior of the Gangetic dolphin, *Platanista gangetica*. Invest. Cetacea 3: 21-33.

INDUS RIVER DOLPHIN

(*Platanista minor*)

Distribution and Migration.—The species (which until recently was thought to be the same as the Ganges dolphin, *P. gangetica*) is confined to the Indus River system of Pakistan and India. It originally occurred throughout the system from tidal limits to the foothills, but is now absent from any sectors. Its movements have been restricted by the construction of many dams ("barrages"), which have split it into several separate populations.

Abundance and Trends.—In 1974 the total population was estimated to be between 450 and 500 animals, the majority (350-400) of which inhabited the 100-mile (160 km) sector of the lower Indus between the Sukkur Barrage and Gaddu Barrage. The population appears to be decreasing at a rate of about 10 percent per year (Kasuya and Nishiwaki, 1975). These dolphins are captured with hoop nets by the local people who eat the meat and use the oil for its alleged medicinal properties.

General Biology.—Almost nothing is known of the life history and ecology of this species, but it is presumably similar to the Ganges dolphin. The gestation period is said to be one year, with mating and calving occurring in March and April. The annual reproductive rate has been roughly estimated at 0.05, and the annual mortality rate at 0.16.

Ecological Problems.—The habitat has been greatly altered by the construction of barrages as part of the extensive irrigation systems in Pakistan.

Allocation Problems.—The marked lowering of the water during the dry sea-

son greatly limits the area available to the dolphins. A more economical utilization of the water for irrigation, so as to maintain water levels above a certain minimum in the reservoirs and main river channels, would benefit the dolphins.

Current Research.—Several field studies have recently been made by biologists from the University of Tokyo, the University of Berne, the California Academy of Sciences, and the International Union for the Conservation of Nature and Natural Resources.

REFERENCES

- Harrison, R. J. 1972. Reproduction and reproductive organs in *Platanista indii* and *Platanista gangetica*. Invest. Cetacea 4: 71-82.
- Herald, E. S., R. L. Brownell, Jr., F. L. Frye, E. J. Morris, W. E. Evans, and A. B. Scott. 1969. Blind river dolphins: first side-swimming Cetacean. Science 166(3911): 1406-1410.
- Kasuya, T. 1972. Some informations on the growth of the Ganges dolphin with a comment on the Indus dolphin. Sci. Rep. Whales Res. Inst. 24: 87-103, plus 3 plates.
- Kasuya, T., and M. Nishiwaki. 1975. Recent status of the population of Indus dolphin. Sci. Rep. Whales Res. Inst. 27: 81-94.
- Pilleri, G. 1970. Observations on the behavior of *Platanista gangetica* in the Indus and Brahmaputra rivers. Invest. Cetacea 2: 27-60.
- 1972. Observations carried out on the Indus dolphin *Platanista indii* in the winter of 1972. Invest. Cetacea 4: 23-29.

FRASER'S (SARAWAK) DOLPHIN

(*Lagenodelphis hosei*)

Distribution and Migration.—Only a single specimen of the Fraser's dolphin, from Borneo, was known to science until 25 of the mammals were taken in a tuna purse seine in the eastern tropical Pacific. Since then, it has been recorded from several widely separated localities in the Pacific and Indian Oceans; Durban, South Africa; near Sydney, Australia; Tokyo, Japan; and the Central Pacific south of Hawaii.

Abundance and Trends.—The animal is rare in collections and presumably not common in its habitat (Perrin, et al., 1973).

General Biology.

Age-Growth Data.—Length at birth is approximately 1 m, and the adults are about 2.5 m long.

Feed Habits.—This dolphin feeds on deep-living fishes and squids.

Ecological Problems.—None known.

Allocation Problems.—Loss of Fraser's dolphins in the eastern Pacific international tuna fishery is minor in terms of absolute numbers, but may be significant considering the apparent extreme rarity of the animal. Twenty-nine of thirty-four identified specimens worldwide have been taken incidentally by tuna seiners.

Current Research.—None.

REFERENCES

- Fraser, F. C. 1956. A new Sarawak dolphin. Sarawak Mus. J. 7: 478-503.
- Perrin, W. F., P. B. Best, W. H. Dawbin, K. C. Balcomb, R. Gambel, and G. J. B. Ross. 1973. Rediscovery of Fraser's dolphin. Sarawak Mus. J. 478-503. 241(5388): 345-350.

SPOTTED DOLPHIN

(*Stenella attenuata*, *S. frontalis*,
S. graffmani, *S. dubia*)

Distribution and Migration.—Knowledge of the spotted dolphins is scanty, and their taxonomy is confused, but two species probably exist. The taxonomy used here is provisional. One form is confined to warm waters of the Atlantic and probably is *Stenella plagiodon* which is discussed in a separate status report. The other apparent species occurs in all tropical waters of the world, including the Atlantic Ocean, and has been identified as belonging to the four above-listed nominal species. Taxonomists do not agree on the taxonomy. The two apparent species are different in basic color pattern but both have spots.

The spotted dolphin occurs in the Gulf Stream adjacent to the U.S. east coast. Nothing is known of its migrations. It has not been recorded from the U.S. Pacific coast, but it is the primary cetacean species involved offshore in the international yellowfin tuna fishery in the eastern tropical Pacific, from Cabo San Lucas to Peru and west to approximately longitude 145° W. In the eastern tropical Pacific, this species commonly associates with the spinner dolphin in mixed aggregations of up to several thousand animals.

Skull measurements and other features indicate that there are at least two races of spotted dolphin in the eastern Pacific and another in Hawaiian waters. They differ in several features. A coastal form is relatively large and robust, has heavy jaws and teeth, and is restricted to onshore waters from Guaymas, Sonora, Mexico, to northern Peru. An offshore race is relatively small and slender, has lightly built jaws and teeth, is spotted to varying degrees, and occurs in offshore waters west to about 145° W longitude. The ranges of the two forms may overlap, or the boundary between them may move seasonally or from year to year. They have not been observed or captured together, but in the central latitudes of the range the coastal form has been collected as far offshore as 50 km and the offshore form as far inshore as 20 km from the coast. The offshore form predominates in the eastern tropical Pacific yellowfin tuna fishery. Another race inhabits the waters around Hawaii and may extend into the South Pacific and to the west. This form is also small and slender, but relatively lightly spotted.

The maximum recorded straight-line movement of a single animal is 1,300 miles (2,080 km) in 236 days.

Abundance and Trends.—Revised extrapolation from a feasibility study of using aerial surveys for estimating the sizes of stocks of dolphins in the eastern tropical Pacific resulted in a first-order approximation of the magnitude of the offshore population of spotted dolphins available to the fishery to be between 3.1 and 3.5 million animals in early 1974. The final estimate of incidental kill in the international tuna fishery during

1974 was 72,000 animals, resulting in a first approximation of the annual rate of incidental mortality for the spotted dolphins available to the fishery to be between 2.1 and 2.3 percent. Revised estimates of incidental kill in previous years are 185,000 animals in 1971, 270,300 animals in 1972 and 114,000 animals in 1973. First-order estimates of the annual capacity for increase (total births minus natural deaths) are 1.4 to 4.0 percent. Another estimate of sustainable yield at present population size was calculated from the incidental kill rate, an estimate of gross annual reproduction (14.4%), and an estimate of average natural mortality in the western Pacific of the same species (8.7%), yielding an estimate of 4.4 percent. The range of estimates of incidental kill rate falls within the range of estimated sustainable yield, leading to the conclusion that the offshore stock of spotted dolphin is probably stable or increasing or decreasing at a low rate.

All the above first estimates are based on a number of presently unverified assumptions. In addition it is not possible at this time to make a probability statement that the above ranges include the true values of stock size, mortality, and mortality rates. Unverified assumptions under examination, which would significantly alter the populations size and rate estimates above, include: (1) that the geographical boundaries are known and (2) that school size estimates are unbiased. Other significant assumptions not readily verifiable for these years include: (1) composition (species, sex, age, etc.) of the observed kill is representative of the total kill and the populations, (2) the species composition is the same for inside and to the west of the yellowfin tuna regulatory area, (3) the observed kill is the only significant fishery-related kill, and (4) incidental kill rates of (a) regulated and non-regulated fishing trips and (b) U.S. and foreign fleets are the same. No estimates of abundances and trends are available for the other stocks. The preliminary estimate of predicted incidental kill in 1975 of all species is 93,000 to 214,000 animals.

General Biology.—Average length at birth is 82.5 cm. Gestation is 11.5 months. Average length at 1 year is 138 cm. Age is estimated from dentinal layers in thin sections of teeth. A two-phase Laird-Gompertz growth model has been fitted to layer-length data. Direct calibration of the dentinal layers beyond the first year (two layers) is not possible, and three alternative hypotheses are considered: (1) two layers per year, until pulp cavity occluded, (2) two layers per year in first year, and the one per year thereafter, and (3) two layers per year until puberty, and one per year thereafter. The second alternative is most probably the correct one, but reproductive parameters below are estimated in terms of layers. Breeding is diffusely seasonal, with prolonged calving seasons in spring and fall and a pronounced low in winter. A third calving season may exist in the summer. Average age at attainment of sexual maturity of males is ap-

proximately 12 layers (average length about 195 cm and average weight about 75 kg). Females attain sexual maturity on the average at about 9 layers and 181 cm. Apparently post-reproductive females are encountered in the samples. Corpora albicantia of ovulation and pregnancy persist indefinitely in the ovaries. It is not possible to distinguish between the two types of corpora. Ovulation rate changes with age, from about four per layer in very young adult females, to about one per layer in older females. The average reproductive cycles lasts 26 months and consists of 11.5 months of pregnancy, 11.2 months of lactation, and 3.3 months of "resting" (not pregnant or lactating). About 4% of lactating females are pregnant. Pregnancy rate decreases with age, from about 0.6 per year at 8 to 10 layers, to about 0.3 at 16 layers. The sex ratio in the population overall is 44.9% males and 55.1% females. Sex ratio changes with age, from near parity at birth, indicating higher mortality rates for males. Gross annual production of calves, based on age and sex structures of the sample and the estimated pregnancy rate, is 14.4% of the population per year. No evidence has been found of age or sex segregation in schooling. The estimated parameters differ in a consistent way from those estimated for a population of *Stenella attenuata* in the western Pacific, possibly reflecting the exploitation in the eastern Pacific.

Feeding Habits.—Spotted dolphins feed on small mesopelagic and epipelagic fishes and squids.

Ecological Problems.—None known.

Allocation Problems.—Because of their association with yellowfin tuna, many of these mammals are taken incidentally during tuna harvesting operations by fishermen from the United States, Canada, France, Japan, Mexico, Panama, and other countries in coastal and international waters in the eastern tropical Pacific.

The foreign share of the tuna catch has been increasing in recent years resulting in an increasing proportion of the total incidental kill being caused by foreign fishermen. (The above estimates are based on the assumption that incidental kill per set on tuna associated with porpoise is the same for foreign vessels as that observed for U.S. vessels.)

Current Research.—The National Marine Fisheries Service and the tuna industry are assessing the effects of porpoise mortality and improving rescue methods and gear to eliminate losses associated with the tuna harvest. No other nation involved in the Pacific tuna fishery is conducting research aimed at improving rescue methods and gear to eliminate porpoise losses associated with the tuna harvest.

Other research includes systematic and ecological studies by P. J. H. van Bree at the Zoological Museum in Amsterdam, W. Dawbin at Sydney University, and E. D. Mitchell at the Arctic Biological Station of the Fisheries Research Board of Canada in Ste. Anne de Bellevue, Quebec.

REFERENCES

- Best, P. B. 1969. A dolphin (*Stenella attenuata*) from Durban, South Africa. *Ann. S. Afr. Mus.* 52(5): 121-135.
- Caldwell, D. K., M. C. Caldwell, W. F. Bathjen, and J. R. Sullivan. 1971. Cetaceans from the Lesser Antilles Island of St. Vincent. *Fish. Bull.* 69(2): 303-312.
- Fraser, F. C. 1960. Description of a dolphin *Stenella frontalis* (Cuvier) from the coast of French Equatorial Africa. *Atlantide-Report No. 1 Scientific Results of the Danish Expedition to the coasts of tropical West Africa 1945-1946*. Danish Press, Copenhagen, 83 p.
- Green, R. E., W. F. Perrin, and B. Petrich. 1971. The American tuna purse seine fishery. In *Modern fishing gear of the world*. Vol. 3. United Nations FAO, Fishing Boats, Ltd., London, 537 p.
- Kasuya, T., N. Miyazaki, and W. H. Dawbin. 1974. Growth and reproduction of *Stenella attenuata* in the Pacific coast of Japan. *Sci. Rep. Whales Research Inst. (Tokyo)* 26: 187-226.
- Mizue, K., and K. Yoshida. 1962. Studies on the little-toothed whales in the West Sea area of Kyushu. IX. About *Prodepinthus* sp., so-called "Madara-Iruka" in Japan caught at Ariko Wa in Goto Is., Nagasaki Pref. *Bull. Fac. Nagasaki Univ.* 13: 1-8.
- National Oceanic and Atmospheric Administration. 1972. Report of the NOAA Tuna-Porpoise Review Committee. Processed report, 63 p.
- National Oceanic and Atmospheric Administration. 1975. Progress of research on porpoise mortality incidental to tuna purse-seine fishing for fiscal year 1975. Southwest Fisheries Center Administrative Report No. LJ-75-68.
- Nishiwaki, M. 1966. A discussion of rarities among the smaller cetaceans caught in Japanese waters. P. 192-202 In Norris, K. S., (ed.). *Whales, dolphins, and porpoises*. Univ. Calif. Press, Berkeley and Los Angeles, 769 p.
- Perrin, W. F. 1969. Using porpoise to catch tuna. *World Fishing*, 18(6): 42-45.
- . 1970. Color pattern of the eastern Pacific spotted porpoise, *Stenella graffmani* Lonnberg (Cetacea, Delphinidae). *Zoologica* 54(4): 134-152.
- . 1975. Distribution and differentiation of population of dolphins of the genus *Stenella* in the eastern tropical Pacific. *J. Fish. Res. Bd. Canada* 32: 1059-1067.
- Perrin, W. F., T. D. Smith, and G. T. Sakagawa. 1974. Status of populations of spotted dolphin, *Stenella attenuata*, and spinner dolphin, *Stenella longirostris*, in the eastern tropical Pacific. Working document presented at meeting of Ad Hoc Consultants Group on Small Cetaceans and Sireniens (Ad Hoc Group 2), Working Party on Marine Mammals, ACMRR, FAO, La Jolla, Calif., 16-19 Dec. 1974, 22 pp. (proc.).
- Perrin, W. F., R. R. Warner, C. H. Fiscus, and D. B. Holts. 1973. Stomach contents of porpoise, *Stenella* spp., and yellowfin tuna, *Thunnus albacares*, in mixed-species aggregations. *Fish. Bull. (U.S.)* 71(4): 1077-1092.
- ATLANTIC SPOTTED DOLPHIN**
(*Stenella plagiodon*)
- Distribution and Migration.**—The Atlantic spotted dolphin (exact taxonomic position not yet known) is probably confined to tropical and subtropical waters of the Atlantic Ocean. It occurs on the U.S. Gulf coast and off the east coast in Gulf Stream waters, and may be restricted to continental waters, being re-
- placed in the West Indies by some other species in this genus (probably *Stenella frontalis*). Seasonal inshore-offshore migrations occur in Florida waters, and perhaps elsewhere in the Gulf of Mexico, with animals moving close to shore in late spring.
- Abundance and Trends.**—Population estimates have not been made for this species. The only known fishery for the species has taken 12 or fewer animals per year for display, however, these animals do not easily withstand handling and captivity. Thus, an increased fishery for display animals is not likely.
- General Biology.**—The newborn are about 0.8 m long, and the adults reach 2.0 to 2.2 m in length. Little is known of the life history of this species. Except for the annual spring migrations to near shore, this species is considered a mammal of the outer continental shelf or adjacent high seas. Spotted dolphins appear to feed primarily on squid in the wild, but they readily adapt to a fish diet in captivity. Newborn and young animals are not spotted, but progress through a series of color changes until the adults become spotted all over except for the ventral surface near the belly. This species is subject to infestations externally by barnacles and whale lice, internally by trematodes in the stomach, liver, and pancreas, and nematodes in the lungs and stomach. In captivity and in cold weather, these animals easily contract pneumonia.
- Ecological Problems.**—Little is known about the ecology of this dolphin, but because it normally lives well offshore, it seems likely that it is little affected by man.
- Allocation Problems.**—None known.
- Current Research.**—Some information on this species has been gathered incidental to studies by the Office of Naval Research on the bottlenosed dolphin. Most of the recent research has been on various aspects of sound production by this species. However, David K. and Melba C. Caldwell have long been gathering general biological information at the Marine Mammal Center of the Communication Sciences Laboratory of the University of Florida located at Marineland, Florida (near St. Augustine).
- REFERENCES**
- Cadenat, J. 1959. Rapport sur les petits Cetaces ouest-africains. Resultats des recherches entropreises sur ces animaux jusqu'au mois des mars 1959. *Bull. I.F.A.N., Ser. A* 21(4): 1367-1409, pls. I-XXXI.
- Caldwell, David K., and Melba C. Caldwell. 1968. Observations on the distribution, coloration, behavior and audible sound production of the spotted dolphin, *Stenella plagiodon* (Cope). *Los Angeles County Mus., Cont. in Sci.* 104: 1-28.
- Caldwell, David K., and Melba C. Caldwell. 1971. Underwater pulsed sounds produced by captive spotted dolphins, *Stenella plagiodon*. *Cetology*, 1: 1-7.
- Caldwell, Melba C., David K. Caldwell, and J. Frank Miller. 1973. Statistical evidence for individual signature whistles in the spotted dolphin, *Stenella plagiodon*. *Cetology*, in press.
- Caldwell, Melba C., Nicholas R. Hall, and David K. Caldwell. 1971. Ability of an Atlantic bottlenosed dolphin to discriminate between, and potentially identify to individual, the whistles of another species: the spotted dolphin. *Cetology*, 6: 1-6.
- Perrin, W. F. 1972. Variation and taxonomy of spotted and spinner porpoises of the eastern tropical Pacific and Hawaii. Ph.D. dissertation, Univ. Calif., Los Angeles, xiv + 590 p.
- Zam, Stephen G., David K. Caldwell, and Melba C. Caldwell. 1971. Some endoparasites from small odontocete cetaceans collected in Florida and Georgia. *Cetology* 2: 1-11.
- SPINNER DOLPHIN**
(*Stenella longirostris*)
- Distribution and Migration.**—The spinner dolphin inhabits tropical inshore and offshore waters around the world. In the United States, it has been recorded on the Gulf of Mexico but not on the U.S. Pacific coast. In the eastern tropical Pacific, this species commonly associates with the spotted dolphin in mixed aggregations of up to several thousand animals. It is involved in the international tuna fishery in the eastern tropical Pacific, from Cabo San Lucas to Peru and west to about longitude 145°W. Little is known of its migrations.
- There are at least three races of spinner dolphin in the eastern Pacific and one in Hawaiian waters, differing modally in several characters. One form that occurs very near the coast of Central America, referred to below as the "Costa Rican" form, is relatively long, slender, and gray.
- A second race, called "eastern spinner," occurs along the coast of Mexico and seaward about 800 km and is relatively short, slender, and gray. A third, called "whitebelly spinner," occurs in far offshore waters west to about 145°W longitude and is relatively short, robust, and white below. A fourth form, relatively long, robust and white below, occurs in Hawaiian waters and possibly to the south and west. The ranges of the eastern and whitebelly forms overlap. In the area of overlap, the two forms are occasionally captured together. A few apparent intergrades have also been collected. The eastern and whitebelly forms are involved in the international tuna fishery.
- The maximum recorded straight-line movement of a single animal is 280 miles (448 km) in 396 days.
- Abundance and Trends.**—Revised extrapolations from a feasibility study of using aerial surveys for estimating the sizes of stocks of dolphins in the eastern tropical Pacific resulted in a first-order approximation of the magnitude of the stock of one of the three eastern Pacific forms, the eastern spinner, of 1.1 to 1.2 million animals. The final estimate of incidental kill in the international tuna fishery during 1974 was 21,000 animals, resulting in a first approximation of the annual rate of incidental mortality for the eastern spinner dolphins available to the fishery to be between 1.8 and 1.9 per-

cent. Estimates of incidental kill were not broken down by race for the years before 1974. Estimates of total incidental kill of all spinner dolphins in earlier years are 130,000 animals in 1971, 65,000 animals in 1972, and 72,000 animals in 1973. The predicted estimate of incidental kill of all species, including the spotted porpoise and others, for 1975 is 93,000 to 214,000 animals. Estimates of natural mortality are not available for the eastern spinner, precluding an impact assessment like that done for the spotted porpoise, but the incidental kill rate for 1974 of 1.8 to 1.9 percent is lower than that for the offshore spotted porpoise (2.1 to 2.3 percent), and if the assumption is made that the two species have similar reproductive capabilities and rates of natural mortality, it seems likely that this population, like that of the offshore spotted porpoise, is either stable or increasing or decreasing slightly.

General Biology.—Average length at birth is 75.7 cm. Gestation is 10.5 months. Average length of males at attainment of sexual maturity is 170 cm. Average length of adult males is 175.5 cm (range 160 to 192 cm). Average length of females at attainment of sexual maturity is 167 cm. Average length of adult females is 170.6 cm (range 153 to 187 cm). Approximately 1% of adult females are post-reproductive. Estimates of annual pregnancy rate range from 0.266 (based on 1973 data) to 0.437 (based on 1974 data). The pooled estimates for all years' data is 0.358. The corresponding estimates of calving interval (reciprocal of pregnancy rate) are 3.77 years, 2.29 years, and 2.80 years, respectively. Overall sex ratio is 1.02 males : 1 female. The ratio changes from 1.22:1 at birth to 0.95:1 in adult-sized animals. Estimates of gross annual reproductive rate based on the 1973 and 1974 data are 0.064 and 0.098, respectively. The estimate based on pooled data for the 2 years is 0.083.

Feeding Habits.—The spinner dolphin feeds on small pelagic fishes and squids.

Ecological Problems.—None known.

Allocation Problems.—Because of its association with yellowfin tuna, this species is taken incidentally by fishermen from the United States, Canada, France, Japan, Mexico, Panama, and other countries in coastal and international waters of the eastern tropical Pacific.

The foreign share of the tuna catch has been increasing in recent years resulting in an increasing proportion of the total incidental kill being caused by foreign fishermen. The increase is expected to continue. The above estimates are based on the assumption that incidental kill per set on tuna associated with porpoise is the same for foreign vessels as that observed for U.S. vessels.

Current Research.—The National Marine Fisheries Service and the tuna fishing industry are assessing the effects of porpoise mortality and improving rescue methods and gear to eliminate losses associated with the tuna harvest. No other nation involved in the Pacific tuna fishery is conducting research aimed at im-

proving rescue methods and gear to eliminate porpoise losses associated with the tuna harvest.

Other research includes systematics and ecological studies by P. J. H. van Bree at the Zoological Museum in Amsterdam, W. Dawbin at Sydney University and E. D. Mitchell at the Arctic Biological Station of the Fisheries Board of Canada in St. Anne de Bellevue, Quebec; and ethological studies by K. S. Norris at the University of California at Santa Cruz.

REFERENCES

- Bree, P. J. H. van. 1971. On skulls of *Stenella longirostris* (Gray 1828) from the eastern Atlantic. (Notes on Cetacea, Delphinoidea IV.) Beaufortia 19:99-105.
- Fitch, J. E., and R. L. Brownell, Jr. 1968. Fish otoliths in cetacean stomachs and their importance in interpreting feeding habits. J. Fish. Res. Bd. Can. 25(12):2561-2574.
- Green, R. E., W. F. Perrin, and B. Petrich. 1971. The American tuna purse seine fishery. In Modern fishing gear of the world. Vol. 3. United Nations FAO, Fishing Books, Ltd., London, 537 p.
- Hester, F. J., J. R. Hunter, and R. R. Whitney. 1963. Jumping and spinning behavior in the spinner porpoise. J. Mammal. 44:586-588.
- Mizue, K., K. Yoshida, and S. Sonoda. 1964. Studies on the little-toothed whales in the West Sea area of Kyusyu. X. About *Prodelphinus* sp., so-called "Hashinaga Iruka" in Japan caught in the sea area around Goto Is., Nagasaki Pref. Bull. Fac. Fish. Nagasaki Univ. 17:10-24.
- Morris, R. A., and L. S. Mowbray. 1966. An unusual barnacle attachment on the teeth of the Hawaiian spinning dolphin. Norsk Hvalfangst-Tid. 55(1):15-16.
- National Oceanic and Atmospheric Administration. 1972. Report of the NOAA Tuna-Porpoise Review Committee. Processed report, 63 p.
- . 1975. Progress of research on porpoise mortality incidental to tuna purse-seine fishing for fiscal year 1975. Southwest Fisheries Center Administrative Report No. LJ-75-68.
- Perrin, W. F. 1969. Using porpoise to catch tuna. World Fishing, 18(6):42-45.
- . 1972. Color patterns of spinner porpoise (*Stenella cf. S. longirostris*) of the eastern Pacific and Hawaii, with comments on delphinid pigmentation. Fish. Bull. 70:983-1003.
- . 1972. Variation and taxonomy of spotted and spinner porpoises of the eastern tropical Pacific and Hawaii. Ph.D. dissertation, Univ. of Calif., Los Angeles, xxvi + 590 p.
- Perrin, W. F., and E. L. Roberts. 1972. Organ weights of noncaptive porpoise (*Stenella* spp.). Southern Calif. Acad. Sci. Bull. 71:19-32.
- Fraser, F. C., and B. A. Noble. 1970. Variation of pigmentation pattern in Meyen's dolphin, *Stenella coeruleoalba* (Meyen). P. 147-164 In Pilleri, G. (ed.), Investigations on Cetacea, Vol. II, Bentelli, Berne, 296 p.
- Girh, M., and G. Pilleri. 1969. On the anatomy and biometry of *Stenella styx* Gray and *Delphinus delphis* L. (Cetacea, Delphinidae) of the western Mediterranean. P. 15-65 In Pilleri, G. (ed.), Investigations of Cetacea, Vol. I, Bentelli, Berne 219 p.
- Hubbs, C. L., W. F. Perrin, and K. C. Balcomb. 1973. *Stenella coeruleoalba* in the eastern and central tropical Pacific. J. Mammal. 54:549-552.
- Kasuya, T. 1972. Growth and reproduction of *Stenella coeruleoalba* (sic) based on the age determination by means of dentinal growth layers. Sci. Rep. Whales Res. Inst. 24:57-79.
- Miyazaki, N., T. Kasaka, and M. Nishiwaki. 1973. Food of *Stenella coeruleoalba*. Sci. Rep. Whales Res. Inst. (Tokyo). 25:265-275.
- Miyazaki, N., T. Kasuya, and M. Nishiwaki. 1974. Distribution and migration of two species of *Stenella* in the Pacific coast of Japan. Sci. Rep. Whales Res. Inst. 26:227-243.

STRIPED DOLPHIN

(*Stenella coeruleoalba*)

Distribution and migration.—The striped dolphin inhabits temperate and tropical waters around the world, and has been recorded from both U.S. coasts. Nothing is known about the movements of striped dolphins in waters contiguous to the United States.

Abundance and Trends.—Population estimates and information on trends are not available for the U.S. or eastern tropical Pacific populations. The Japa-

nese currently take about 5,000 striped dolphins per year (Kasuya 1972).

General Biology.—Biological data are based on studies carried out on the population off Japan.

Reproductive Data.—The gestation period is 12 months long. Lactation lasts about 18 months, and the mean length of the reproductive cycle is about 3 years. Schools of striped dolphins segregate somewhat by age and sex.

Age-Growth Data.—The mean length of the newborn is 1 m. The mean age at sexual maturity in males and females is 9 years at 2.2 and 2.1 m, respectively.

Feeding Habits.—The stomachs of 27 specimens taken off Japan contained remains of mesopelagic fishes, squids, and crustaceans; myctophid fishes dominated.

Ecological Problems.—None known.

Allocation Problems.—The striped dolphin is involved in the eastern Pacific international tuna fishery to a minor extent.

Current Research.—A Federal program of research recently begun by Japan is expected to yield an estimate of population size in the northwestern Pacific Ocean. Studies of striped dolphins incidentally killed in the international tropical tuna fishery are underway at the Southwest Fisheries Center.

REFERENCES

- Fraser, F. C., and B. A. Noble. 1970. Variation of pigmentation pattern in Meyen's dolphin, *Stenella coeruleoalba* (Meyen). P. 147-164 In Pilleri, G. (ed.), Investigations on Cetacea, Vol. II, Bentelli, Berne, 296 p.
- Girh, M., and G. Pilleri. 1969. On the anatomy and biometry of *Stenella styx* Gray and *Delphinus delphis* L. (Cetacea, Delphinidae) of the western Mediterranean. P. 15-65 In Pilleri, G. (ed.), Investigations of Cetacea, Vol. I, Bentelli, Berne 219 p.
- Hubbs, C. L., W. F. Perrin, and K. C. Balcomb. 1973. *Stenella coeruleoalba* in the eastern and central tropical Pacific. J. Mammal. 54:549-552.
- Kasuya, T. 1972. Growth and reproduction of *Stenella coeruleoalba* (sic) based on the age determination by means of dentinal growth layers. Sci. Rep. Whales Res. Inst. 24:57-79.
- Miyazaki, N., T. Kasaka, and M. Nishiwaki. 1973. Food of *Stenella coeruleoalba*. Sci. Rep. Whales Res. Inst. (Tokyo). 25:265-275.
- Miyazaki, N., T. Kasuya, and M. Nishiwaki. 1974. Distribution and migration of two species of *Stenella* in the Pacific coast of Japan. Sci. Rep. Whales Res. Inst. 26:227-243.

COMMON DOLPHIN, WHITEBELLY PORPOISE

(*Delphinus delphis*)

Distribution and Migration.—This species is worldwide in distribution in temperate to tropical waters of from 12°-28° C. There may be more than one species; pronounced variation in size, shape, and coloration has been demonstrated for three distinct populations in the eastern Pacific (W. E. Evans, pers. comm.). In the northwestern Atlantic Ocean, where this animal is also known as the saddleback dolphin, this mammal ranges from Newfoundland to the Caribbean Sea. In the northeastern Pacific

Ocean, the primary distribution of this species is from the California-Oregon border to Costa Rica, but one stranded animal was found in British Columbia. Large populations occur off southern California (Santa Barbara to San Diego), the west coast of Baja California, Mexico (Cedros Island to Cape San Lucas), and Costa Rica. A relatively large population also occurs in, and may be a resident of, the Gulf of California. In southern California waters *Delphinus* is present throughout the year but is most abundant from August to January. An observed decrease in herd size during the spring and summer may be due primarily to the animals breaking up into small subgroups of 50 to 200 animals, and a general movement offshore and northward.

Abundance and Trends.—No estimates have been made on stock sizes.

General Biology.

Reproductive Data.—Males and females may segregate between mating seasons, especially when the latter are nursing calves or are about to bear their young. The gestation period lasts 10–11 months with a post-parturition estrus. The young dolphin is weaned at about age 5–6 months (110–120 cm overall length), but may stay with the female up to 1 year. In the northeastern Pacific Ocean, this species appears to have two mating seasons (January–April and August–November), and two calving seasons (March–May and August–October).

Age-Growth Data.—The young are 75–85 cm at birth. The males grow to 2.6 m and are an average of 14 cm longer than females. The average individual of the northeastern Pacific Ocean is larger than that of the Black and Mediterranean Seas. The largest known specimen from the Black Sea was 212 cm; however, in the northeastern Pacific Ocean a male 259 cm long was taken.

Parasites and Disease.—Parasitism has been implicated in natural mortality. The brains of 12 stranded specimens contained flukes and their eggs, which in most cases had caused abscesses and lesions.

Feeding Habits.—This species is seldom found inside the 100-fathom line, but it frequents seamounts, escarpments, and other prominent offshore features. The animal makes most of its dives in excess of 10 fathoms after sunset. The deepest dive recorded is 140 fathoms, but the average dive is to 30 fathoms. During feeding the animal stays under water for 2 to 3 minutes, but dives of 5 minutes have been recorded. It feeds mainly on anchovy, sprat, pelagic pipefish, and cephalopods in the Black Sea; whiting, horse mackerel, sardine, and hake in the Atlantic Ocean; and anchovy, cephalopods, myctophids, and hake in the northeastern Pacific Ocean.

Ecological Problems.—None known.

Allocation Problems.—Because the northern anchovy and squid constitute the bulk of this mammal's diet in the northeastern Pacific Ocean, a substantial increase in the fishery for these resources might have a noticeable effect on the porpoise populations. *Delphinus* is

the third most important species of porpoise taken incidentally in the eastern tropical Pacific international tuna purse seine fishery.

The final estimated incidental kill in the international tuna fishery during 1974 was 4,000 animals. Estimates of incidental kills in previous years are 4,000 animals in 1971, 9,000 animals in 1972, and 22,000 animals in 1973.

Current Research.—The National Marine Fisheries Service and the tuna fishing industry are assessing the effects of propoised mortality and improving rescue methods and gear to eliminate losses associated with the tuna harvest. Studies of behavior, distribution, and abundance have been conducted by the Naval Undersea Center, San Diego, California, since 1968. This research terminated at the end of FY '73 at NUC but will continue at the Southwest Fisheries Center.

REFERENCES

- Evans, W. E. 1971. Orientation behavior of *Delphinus*: radio telemetric studies. *Ann. N.Y. Acad. Sci.* 188:142–162.
- Gehr, M., and G. Pilleri. 1969. On the anatomy and biometry of *Stenella styx* Gray and *Delphinus delphis* L. (Cetacea, Delphinidae) of the western Mediterranean. P. 15–65 In Pilleri, G. (ed.), *Investigations on Cetacea*, Vol. I, Berne, Switzerland. 219 p.
- National Oceanic and Atmospheric Administration. 1972. Report of the NOAA Tuna-Porpoise Review Committee. Processed report, 63 p.
- Norris, K. S., and J. H. Prescott. 1961. Observations on Pacific cetaceans of California and Mexican waters. *Univ. Cal. Publ. Zool.* 63(4):291–402.
- Sleptsov, M. M. 1940. Determination of the age of *Delphinus delphis* L. *Bull. Soc. Moscow, S. Biologique*. 49(2):43–61. *Fish. Res. Bd. Can. Transl.* No. 46, 1957.
- Tomlin, A. G. 1948. On the biology and physiology of the Black Sea dolphin. *Zool. Zhur.* 27(1):53–64.

NORTHERN RIGHT WHALE DOLPHIN

(*Lissodelphis borealis*)

Distribution and Migration.—Little is known about the distribution of the northern right whale dolphin other than that it inhabits temperate waters of the North Pacific Ocean.

In the western North Pacific Ocean, the northern right whale dolphin is found from Cape Inubo, Japan, north as far as Etorofu and Paramushir Islands, from where it apparently migrates southward in autumn or winter to near the southern Kurils and is common, at least seasonally, in the northern Sea of Japan.

In the eastern North Pacific, this species has been reported from 29° to 50° north latitudes, though mostly from California. It occurs in the southern California continental borderland only from October or November to about April.

Though it is also oceanic, the right whale dolphin has been observed most frequently along the continental slope and near such features as seamounts and banks. It has been seen close to the California Channel Islands and the mainland coast near San Diego and Palos Verdes. Two sightings and one specimen from the central Pacific suggest that the

species may be continually distributed across the temperate North Pacific.

Abundance and Trends.—Groups of 200 are most common, but herds of estimated size of from 300 to 1,000, Japan and up to 2,000 off southern California have been seen. Although this species was once thought to be uncommon, aerial surveys have revealed that it is abundant off the Pacific Coast of North America (Leatherwood, personal communication). This species is reportedly common in the northern Sea of Japan (Okada and Hanacka, 1949), where it is harvested.

General Biology.—Newborn animals are about 0.6 m in length and generally lighter in color than adults and grow 3.1 m. The species is gregarious and frequently reported in close association with the white-sided dolphin, with which it shares an extensive common range.

Right whale dolphins may reach speeds in excess of 25 knots in bursts. One entire herd averaged over 15 knots for 30 minutes while attempting escape from a helicopter. When approached, the animals may move away quietly or in series of low angle leaps, each covering much as 7 m. Individuals that are wide scattered when approached bunch together tightly while fleeing from the cause of their disturbance.

Food is primarily squid, but also miscellaneous fishes, including myctophids and engraulids. Parasites include trematodes and cestodes.

Ecological Problems.—If migration are food dependent, as they appear to be, decimation or contamination of food supplies in the southern end of its range could adversely affect the species.

Allocation Problems.—None known.

Current Research.—The only research known is an unfunded examination of museum materials, collection of beach specimens, and survey of literature being conducted by J. S. Leatherwood, NMFS, San Diego, R. F. Green, Ventura College, Calif., and W. A. Walker, Palos Verde, California.

REFERENCES

- Brownell, R. L. 1964. Observations of odontocetes in central California waters. *Nor. Hvalfangst-Tid.* 3:60–66.
- Fiscus, C. H., and K. Niggol. 1965. Observations of cetaceans off California, Oregon and Washington. *U.S. Fish Wildl. Serv. Spec. Sci. Rep. Fish.* 408, 27 p.
- Leatherwood, S., and R. F. Green. 1976. The right whale dolphins, *Lissodelphis* spp.: synoptic account of the genus. In S. L. Ridgway and R. Harrison (ed.), *A handbook of marine mammals of the world*. New York: Academic Press (in preparation).
- Leatherwood, S., R. F. Green, and W. A. Walker. 1976. Some observations of the northern right whale dolphin, *Lissodelphis borealis*, in the eastern North Pacific. *Trans. San Diego Soc. Nat. Hist.* (in review).
- Nishiwaki, M. 1972. General biology. *Cetaceans in Mammals of the sea, biology and medicine*. Sam H. Ridgway (ed.), Charles C. Thomas, Springfield.
- Norris, K. S., and J. H. Prescott. 1963. Observations of Pacific cetaceans in California and Mexican waters. *Univ. Calif. Publ. Zool.* 63:291–402.

Okada, Y. and T. Hanaoka. 1940. A study of Japanese Delphinidae. Sci. Rep. Tokyo Bunrika Daijaku 4: 77. 285-308.
Tomilin, A. G. 1957. Mammals of the USSR and adjacent countries. Vol. 9. Cetacea. Izd. Akad. Nauk SSSR, Moskva. Transl. IPST, Jerusalem. 1967.

MELON-HEADED WHALE
(*Peponocephala electra*)

Distribution and Migration.—*Peponocephala* inhabits the tropical Atlantic, Indian, and Pacific Oceans.

Abundance and Trends.—The status of this species is unknown, except that it is apparently rare (Nishiwaki and Norris, 1966).

General Biology.—Unknown.

Ecological Problems.—None known.

Allocation Problems.—A few are taken annually in the eastern Pacific international purse seine fishery for tuna. This small take is probably insignificant.

Current Research.—None.

REFERENCES

- Nishiwaki, M. and K. S. Norris. 1966. A new genus *Peponocephala* for the odontocete cetacean species *Electra electra*. Sci. Rep. Whales Res. Inst. 20:95-100.
Perrin, W. F. (in press). First record of the melon-headed whale *Peponocephala electra*, in the eastern Pacific, with a summary of world distribution. Fish. Bull. (U.S.).

PYGMY KILLER WHALE
(*Feresa attenuata*)

Distribution and Migration.—The pygmy killer whale probably inhabits most tropical waters.

Abundance and Trends.—The status of this species is unknown except that it is apparently rare (Caldwell and Caldwell, 1971). The species has been captured for exhibit in the oceanaria of Hawaii and Japan. In the continental U.S. it has been recorded only twice, once in Florida, once in Texas.

General Biology.—The adults reach about 2.4 m. In appearance they resemble a small false killer whale. They are aggressive in captivity, with captives of other species showing fright reactions to them.

Ecological Problems.—None known.

Allocation Problems.—This species has been reported as captured to a very minor extent in the yellowfin tuna fishery in the eastern tropical Pacific.

Current Research.—None.

REFERENCES

- Best, P. B. 1970. Records of pygmy killer whale, *Feresa attenuata*, from southern Africa, with notes on behavior in captivity. Ann. S. Afr. Mus. 57(1):1-14, 9 pls.
Caldwell, David K., and Melba C. Caldwell. 1971. The pygmy killer whale, *Feresa attenuata*, in the western Atlantic, with a summary of world records. J. Mammal. 52:206-209.
Caldwell, D. K., and M. C. Caldwell. 1975. Pygmy killer whales and short-snout spinner dolphins in Florida. Cetology, No. 18, 5 p.
James, P., F. W. Judd, and J. C. Moore. 1970. First western Atlantic occurrence of the pygmy killer whale. Fieldiana, Zoology 58(1):1-3.

Nishiwaki, M., T. Kasuya, T. Kamiva, T. Tobayama, and M. Nakajima. 1965. *Feresa attenuata* captured at the Pacific Coast of Japan in 1963. Sci. Rep. Whales Res. Inst. 19:65-90.

Perrin, W. F., and C. L. Hubbs. 1969. Observations on a young pygmy killer whale (*Feresa attenuata* Gray) from the eastern tropical Pacific Ocean. Trans. San Diego Soc. Nat. Hist. 15(18):297-308.

FALSE KILLER WHALE
(*Pseudorca crassidens*)

Distribution and Migration.—The false killer whale ranges through all temperate and tropical seas. It is an oceanic form, found on the Atlantic side of the United States from North Carolina south, and on the Pacific side from the Aleutian Islands south.

Abundance and Trends.—This species is uncommon throughout most of its range. It is seldom caught in the Japanese small whale fishery but is common on the Pacific side of Honshu (Ohsumi, 1972).

General Biology.—The males grow to 6.1 m and the females to 4.9 m; adult animals weigh up to 1,360 kg. Mating appears to be over a protracted period, with young born at about 1.8 m. False killer whales are found in schools of both sexes and all ages. They have been seen eating dolphinfish (mahi-mahi) off Hawaii.

Ecological Problems.—Schools of up to 835 of these animals have stranded.

Allocation Problems.—The Japanese state that a toothed whale (shachi), which may or may not be the false killer whale, does much damage to their longline tuna industry by feeding on hooked fish.

Current Research.—None.

REFERENCES

- Bullis, H. H., and H. C. Moore. 1956. Two occurrences of false killer whales, and a summary of American records. Am. Mus. Nov. 1756:1-5.
Mizue, K., A. Takemura, and K. Nakasai. 1969. Studies on the little-toothed whales in the West Sea area of Kyushu. XVI. Underwater sound of the false killer whale. Bull. Facult. Fish., Nagasaki Univ. 28:19-29.
Ohsumi, S. 1972. Catch of marine mammals, mainly of small cetaceans, by local fisheries along the coast of Japan. Bull. Far Seas Fish. Res. Lab. No. 7, 137-166.
Yamaguchi, Y. 1964. On the predation of tuna longline catches by the smaller toothed whales (Sachi) Maguro Gyogyo (Tuna Fishing) 27:59-73. (Transl. by T. Otsu, NMFS, Hawaii, June 1972.)

LONG-FINNED PILOT WHALE
(*Globicephala melaleuca*)

Distribution and Migration.—This pilot whale ranges from Greenland, Iceland, and the Barents Sea south to Virginia and the Mediterranean. It is a schooling mammal and appears regularly off the Canadian and United States coasts. It also inhabits temperate waters of the Southern Ocean. It generally favors pelagic regions, but often moves close to shore in search of food.

Abundance and Trends.—Mercer (1975) estimates the original Newfound-

land stock prior to 1947 at less than 60,000. There are no estimates for other parts of its range. About 40,000 were killed from 1951 to 1959 in local Newfoundland fisheries (Sergeant, 1962), but only 6,902 have been taken between 1962 and 1973. About 177,030 were taken in the Faeroe Islands from 1584 to 1883 (Tomilin, 1957), and 16,564 were taken by Norway and Denmark between 1962 and 1973 (Christensen, 1975). A total of 468 were driven ashore in Ireland in 1840, 1844, 1851, 1853, and 1957; one school of undetermined number was taken in 1965 (O'Riordan, 1975).

General Biology.—The adults grow to about 6.5 m; females are usually mature at age 6 to 7 years and males at about age 12. Calves are about 1.8 m long at birth, in July to August, although full-term fetuses have been found year-round. Cows probably bear calves every 3 years, gestation period is about 16 months, and lactation lasts about 2 years. Pilot whales are gregarious, and occur in schools of hundreds and thousands. They have a distinct social organization; however, the sex ratio is not always equal in stranded groups. They are believed polygamous, with bachelor males sometimes forming separate schools. They travel in tight schools when not feeding, and disperse into scattered groups when on feeding grounds. Captive pilot whales feed at night and sleep days. They have a top swimming speed of over 25 mph. and a longevity of about 50 years. They feed almost exclusively on squids, but also eat small fish such as clupeids and gadids. Sergeant (1962) estimates food intake per year at about 11.5 times the weight of the animal.

Ecological Problems.—Whole schools sometimes strand.

Allocation Problems.—None known.

Current Research.—None.

REFERENCES

- Christensen, I. 1975. Preliminary report on the Norwegian fishery for small whales: expansion of Norwegian whaling to Arctic and northwest Atlantic waters, and Norwegian investigations of the biology of small whales. J. Fish. Res. Bd. Can. 32(7):1083-1094.
Sergeant, D. E. 1962. The biology of the pilot or pothead whale *Globicephala melaleuca* (Trall) in Newfoundland waters. Bull. Fish. Res. Bd. Can.
Mercer, M. C. 1975. Modified Leslie-DeLury population models of the long-finned pilot whale (*Globicephala melaleuca*) and annual production of the short-finned squid (*Illex illecebrosus*) based upon their interaction at Newfoundland. J. Fish. Res. Bd. Can. 32(7):1145-1154.
O'Riordan, C. G. 1975. Long-finned pilot whales, *Globicephala melaleuca*, driven ashore in Ireland, 1800-1973. J. Fish. Res. Bd. Can. 32(7):1101-1103.
Tomilin, A. G. 1957. (Mammals of the USSR and adjacent countries. Vol. 9 Cetacea.) Izdatel. Akad. Nauk. SSSR. IPST Transl. No. 1124. 1967.

SHORT-FINNED PILOT WHALE
(*Globicephala macrorhynchus*)

Distribution and Abundance.—In the North Atlantic Ocean, this pilot whale has been reported from New Jersey

though it is far more common south of about Cape Hatteras) and Madeira and ranges south to at least northern Senegal and Dakar, Senegal. In the North Pacific Ocean it is found from Japan and the Aleutian Islands to probably Peru. It is an oceanic species with a very wide range. Schools of pilot whales appear regularly off U.S. coasts. It generally favors offshore waters, but often moves closer to land in search of food. Greatest numbers are seen in the eastern North Pacific in winter, fewer in summer.

Abundance and Trends.—The status of this species is unknown except that it is fairly abundant around the California Channel Islands (Norris and Prescott, 1961). The population of pilot whales around the Channel Islands has been fished for live specimens to supply U.S. oceanaria since about 1955. Many pilot whales are taken in the Japanese small-whale fishery. This species is also taken in the lesser Antilles.

General Biology.—The adults grow 4.6 to 6.7 m. Little work has been done on this species, but indications are that the general biology is similar to *G. melana*.

Ecological Problems.—Schools of this species often strand.

Allocation Problems.—None known.

Current Research.—The taxonomy of Pacific *Globicephala* is being studied by R. L. Brownell and D. K. Caldwell in the United States, and T. Kasuya and M. Nishiwaki in Japan. The U.S. Naval Undersea Center is studying the behavior and distribution of the pilot whale in southern and Baja California.

REFERENCES

- Bree, P. J. H. van, 1971. On *Globicephala setboldi* Gray, 1846, and other species of pilot whale (Notes on Cetacea, Delphinidae III). *Beaufortia*, 19(249):79-87.
- Norris, Kenneth S., and John H. Prescott, 1961. Observations of Pacific cetaceans of Californian and Mexican waters. *Univ. Calif. Publ. Zool.* 63:291-402.
- Tomlin, A. G. 1957. (Mammals of the USSR and adjacent countries. Vol. 9 Cetacea.) *Izdatel. Akad. Nauk. SSSR. IPST Transl.* No. 1124, 1967.

KILLER WHALE

(*Orcinus orca*)

Distribution and Migration.—The killer whale is worldwide and ranges north and south to polar ice. It is more common in cooler waters, and in more productive coastal areas. The Strait of Georgia in British Columbia, Prince William Sound in Alaska, and Puget Sound in Washington State are areas of concentration. Migratory habits are probably dependent on food supply, and killer whales are most numerous in Puget Sound in November and late summer. In Japan, most of these mammals are taken from April to November, with the greatest number from August to November. In the Norway fishery, killer whales seem dependent on distribution and migration of herring, capelin, and cod.

Abundance and Trends.—Authoritative estimates of the world population are not available. A limited cooperative effort of the Fisheries Research Board of Canada and the Washington State Department of Game primarily in the inside

waters of Washington and British Columbia gave counts of 459 killer whales in 1971, 255 in 1972, and 249 in 1973. About 65 individuals have been removed from inside waters of British Columbia and northern Washington State since 1962 for display by marine aquariums in 25 captive operations. Eleven of these whales were killed during U.S. capture operations, mostly during the early years. Two killer whales were killed in Canadian capture operations. The Japanese fisheries took 1,439 killer whales from the Okhotsk Sea to south of Japan from 1948 to 1974. Norwegians harvested 2,096 in the northeastern North Atlantic between 1938 and 1974. The U.S.S.R. took 444 animals in the Antarctic and North Pacific between 1958 and 1974. South Africa took 27 whales from 1972 to 1974.

General Biology:

Species Statistics.—Females grow to 7.0 m and males to 8.2 m. Males weigh up to about 8,000 kg, with about 4,000 kg the apparent limit for females. An adult male dorsal fin may be 1.8 m high, considerably higher than that of the female. The body has conspicuous white markings on a black background.

Reproductive Data.—Breeding appears to occur year-round although it may peak in May to July; gestation lasts 13 to 16 months. In the northern hemisphere births occur mostly in autumn.

Age-Growth Data.—Newborn calves are about 2.4 m long and weigh about 180 kg.

Feeding Habits.—Killer whales usually are found in groups of 10 to 100 or even more. The males are probably polygynous. Killer whales hunt successfully in packs, but there are no records of attacks on people.

The stomach contents of 364 killer whales taken off Japan from 1948 to 1957 included (in order of occurrence): fish (mostly cod, flatfish, and sardines), squid, octopus, dolphins, whales, and seals. Salmon constituted 1.6% of all stomach contents. Soviets in the Kurils recorded "fish and squid" but no marine mammal remains in 10 animals. Of 8 killer whales examined by the National Marine Fisheries Service, Seattle, 6 adult males had only marine mammal remains except for 1 squid; 1 adult female and 1 immature male had only fish remains. Food consumption has been estimated at 4% of the body weight per day.

Parasites and Diseases.—The most common diseases are those caused by wearing of tooth crowns and denudation of the pulp cavity, which results in abscesses. Other diseases include bony outgrowths and bone tumors. Parasites include nematodes, cestodes, and trematodes. One Puget Sound killer whale stomach contained 5,000 nematodes.

Ecological Problems.—This species has no natural enemies except man. Stranding probably is the greatest nonhuman hazard.

Allocation Problems.—Public interest in killer whales was stimulated by the first live capture in 1964 in British Columbia. Growing public interest is increasing in killer whales as a recreational resource, especially in Puget Sound (Haley, 1970). The animals are commer-

cially valuable in the United States display in oceanariums. U.S., Japanese and Canadian fishermen contend that the whales cause gear damage and interfere with salmon and tuna longline fisheries. Many consider killer whales an important predator of salmon and herring. Others defend them as the natural enemy of other fish eaters, including herring seals and sea lions. Some sports salmon fishermen claim their presence spoils fishing.

Current Research.—The National Marine Fisheries Service and the Fisheries Research Board of Canada are studying killer whale distribution in western U.S. and Canadian waters.

REFERENCES

- Bigg, M. A., and A. A. Wolman, 1975. Live capture killer whale fishery, British Columbia and Washington, 1962-73. *J. Fish. Res. Bd. Can.*, 32(7):1213-1221.
- Haley, D. 1970. Views on the killer whale dispute. *Pacific Search*, 5(1):1-3.
- Jonsgard, A., and P. B. Lysholm, 1970. A contribution to the knowledge of the biology of the killer whale *Orcinus orca* (L.). *Nord. Magasin for Zool.* 18:41-48.
- Nishiwaki, M., and C. Handa, 1958. Killer whales caught in the coastal waters of Japan for recent 10 years. *Sci. Rep. Whar. Res. Inst.* 13:85-96.
- Rice, D. W. 1968. Stomach contents and feeding behavior of killer whales in the eastern North Pacific. *Norsk Hvalfangst-Tid.* 57:338.

HARBOR PORPOISE

(*Phocoena sinus* and *Phocoena phocoena*)

Distribution and Migration.—The harbor porpoise is circumpolar in distribution in ice-free seas, ranging south to the Atlantic Ocean to the Delaware River and the Mediterranean Sea. In the Pacific Ocean it is found south to Japan and southern California, although it is not abundant south of San Francisco.

The harbor porpoise is an inshore species, frequenting coastal waters, the mouths of large rivers, harbors, and bays and sometimes ascending freshwater streams.

Abundance and Trends.—The harbor porpoise is especially abundant in the waters of Washington (Scheffer and Slipp, 1948) and western Canada (Pike and MacAskie, 1969). It is common on the coast of Maine near Boothbay Harbor during the summer (Gaskin, Arnold and Blair, 1974). Tomlin (1957) reports single catches of 2,000 to 2,500 harbor porpoises at the time they migrate between the Sea of Azov and the Black Sea.

Mohl-Hansen (1954) reporting on biological investigations of the harbor porpoise in Danish waters examined 188 harbor porpoises in 1941-42, 230 in 1942-43, and 212 in 1943-44, so at least those numbers were commercially harvested in Denmark during those years. He also states that these harbor porpoises were from the Baltic Sea populations.

Catches of *P. phocoena* in west Greenland recently have averaged over 2,500 annually. During 1972, an estimated 1,500 animals were taken in the nonGreenlandic salmon driftnet fishery. No estimates are available for Greenland.

driftnetters. In addition, about 1,000 are taken annually in direct catches (Kapel, 1975). In the Black Sea, where a moratorium has existed since 1967, an estimate of the present population is 25,000 to 30,000. Incidental catches of *P. sinus* have ranged from tens to the low hundreds annually.

General Biology.—This species grows to 1.8 m, and weighs up to 72 kg. The females are sexually mature at about age 3 to 4 years. Newborn calves are half the length of the mother. They breed annually during late spring and summer. The gestation period is 10 to 11 months, and the calves nurse up to 8 months. Harbor porpoises travel in pairs and schools of up to 200 or more, especially on the feeding grounds. This species is less playful than most dolphins or porpoises; they seldom jump out of the water, and usually ignore passing boats. Schools containing all "bachelors" are common; the females stay in groups of mixed sex. Usually they swim just below the surface, rising about 4 times per minute to breathe when not feeding. They feed mainly on bottom fishes such as cod, herring fry, flounder, and occasionally on invertebrates such as squids, clams, and crustaceans. Parasites of the alimentary canal and respiratory system are common (Gaskin, Arno'd and Blair, 1974).

Ecological Problems.—These animals occasionally strand for unknown reasons, and because of their feeding habits, a few tend to get trapped in fishermen's nets (see Abundance and Trends). They are preyed upon to an unknown degree by Greenland sharks, great white sharks and killer whales. Significant residues of chlorinated hydrocarbon insecticides and PCB's have been recorded from the Baltic, United Kingdom and Bay of Fundy.

Allocation Problems.—None known.
Current Research.—None.

REFERENCES

- Fisher, H. D., and R. J. Harrison. 1970. Reproduction in the common porpoise (*Phocoena phocoena*) of the North Atlantic. *J. Zool.* 161:471-486.
- Gaskin, D. E., P. W. Arnold, and B. A. Blair. 1974. *Phocoena phocoena*. Mammalian Species, No. 42. 8 p.
- Kapel, F. O. 1975. Preliminary notes on the occurrence and exploration of smaller cetaceans in Greenland. *J. Fish. Res. Board Can.* 32(7):1079-1082.
- Lear, W. H., and O. Christensen. 1975. Bycatches of harbour porpoise (*Phocoena phocoena*) in salmon driftnets at West Greenland in 1972. *J. Fish. Res. Board Can.* 32(7):1223-1228.
- Mohl-Hansen, U. 1954. Investigations on reproduction and growth of the porpoise (*Phocoena phocoena* L.) from the Baltic. *Vidensk. Medd. fra Dansk Naturh. Foren.* 116:369-396.
- Norris, K. S., and W. N. McFarland. 1958. A new harbor porpoise of the genus *Phocoena* from the Gulf of California. *J. Mammal.* 39:22-39.
- Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. *Fish. Res. Bd. Can. Bull.* 171, 54 p.
- Scheffer, V. B., and J. W. Slipp. 1948. The whales and dolphins of Washington State with a key to the cetaceans of the west coast of North America. *Amer. Midl. Natur.* 39(2):257-337.
- Tomilin, A. G. 1957. Zverii SSSR i prilezhashchikh stran. Tom 9. Kitobraznye (Mammals of the USSR and adjacent countries Vol. IX. Cetacea.) Moscow. Akad. Nauk. SSSR. 756 p. Transl. by IPST, Jerusalem. 1967. xiii plus 717 p.
- DALL PORPOISE**
(*Phocoenoides dalli*)
- Distribution and Migration.**—The Dall porpoise inhabits the North Pacific Ocean from Japan and central Baja California north into the Bering and Okhotsk Seas. In both areas the southern limits of distribution appear to expand with the cooling of waters to at least 56° F, and individuals are seen in areas having surface temperatures of up to 62° F. It has been observed in the Bering Sea in locations and at periods when surface waters were 36° F. In the northeastern Pacific, Dall porpoises are year round residents as far south as the northern Channel Islands but are found further south and further inshore, as far as Cedros and Guadalupe Islands, from about October to late May. They are observed off Monterey Bay throughout the year, though there appears to be a separation of smaller juveniles inshore from more heterogeneous groups offshore, and apparent inshore migrations tend to increase numbers of all animals there during winter and early spring. Dall porpoises are reported off San Francisco Bay from at least March through November. The southern and inshore movements appear closely related to movements of squid, a primary food item. The species is found offshore of the eastern Pacific coast to at least 650 miles. The Marine Mammal Division has many records of Dall porpoise ranging from the Bering Sea and the eastern Aleutian Islands south to latitude 34 in California waters (MMD files, Marine Mammal Observations, 1958-72). The NMFS Southwest Fisheries Center and the Naval Undersea Center, San Diego, have similar detailed records of occurrences south to Cedros and Guadalupe Islands.
- Abundance and Trends.**—The Dall porpoise is one of the abundant small cetaceans found in Alaskan inside waters (U.S. Forest Service) and in British Columbia waters (Pike and MacAskie, 1969). It is commonly seen off northern California (W. J. Houck, pers. comm.). The species appears to be abundant throughout its range. Kasuya (1974) also stated that between 4,500 and 7,500 are caught annually in coastal eastern Japan waters, but there has been a decrease in catch per unit effort in recent years.
- General Biology.**—There may be two forms of Dall porpoise (*P. dalli* and *P. truei*). They grow to lengths of about 2.2 m and weights of about 218 kg. They and the killer whale have the most conspicuous color patterns among cetaceans. Calves are born in the spring and summer, and young are observed in August. These animals are usually found in groups of 2 to 20, but occasionally 200 or more are seen on favorable feeding grounds. It plays in the bow waves of ships, and is among the swiftest of all marine mammals. This mammal consumes squid and such fish as saury, hake, herring, jack mackerel, and bathypelagic and deep-water benthic fish.
- Ecological Problems.**—None known.
Allocation Problems.—Kasuya (1974) reports on annual accidental catch of more than 20,000 Dall porpoise in the Japanese high seas salmon gillnet fishery in the northern North Pacific and Bering Sea west of 175° W longitude. Mizue and Yoshida (1965) state the Dall porpoise is abundant east of 175° W longitude but that the Japanese fishing fleet does not operate east of the boundary.
- Current Research.**—W. J. Houck is studying *P. dalli* and *P. truei* at Humboldt State College in California, and M. Nishiwaki is studying these species in Japan. G. V. Morejohn is studying feeding habits, migration, behavior, and morphology of the species at the Moss Landing Marine Station, California. S. Leatherwood is monitoring seasonal movements of the species into waters of southern and Baja California.

REFERENCES

- Kasuya, T. 1974. Biology, catch, and populations of *Phocoenoides* in the western North Pacific. FAO/ACMRR Report, Doc. 2, 20 p.
- Leatherwood, S., and M. R. Fielding. 1974. Distribution and movements of the Dall porpoise *Phocoenoides dalli* in the temperate eastern Pacific. Working paper submitted by FAO/ACMRR Group, Dec. 1974. La Jolla, California.
- Mizue, K., and K. Yoshida. 1965. On the porpoises caught by the salmon fishing gillnet in Bering Sea and the North Pacific Ocean. *Bull. Facult. Fish. Nagasaki Univ.* 19:1-36.
- Mizue, K., K. Yoshida, and A. Takemura. 1966. On the ecology of the Dall's porpoise in Bering Sea and the North Pacific Ocean. *Bull. Facult. Fish., Nagasaki Univ.* 21:1-21.
- Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. *Fish. Res. Bd. Can. Bull.* 171, 54 p.
- U.S. Forest Service. 1972. Marine mammal observations in southeastern Alaska and Prince William Sound. Unpublished field records.

BELUGA WHALE, BELUKHA
(*Delphinapterus leucas*)

Distribution and Migration.—The beluga inhabits the Arctic Ocean and adjacent seas, including the Okhotsk and Bering Seas, Cook Inlet, Hudson Bay, and Gulf of St. Lawrence. Belugas ascend several hundred miles up the large rivers of Siberia and Alaska. Populations of white whales from different areas show marked size differences through the Arctic. Three races are recognized by some authorities: *dorojevi* from the Okhotsk Sea; *marisulbi* in the Barents and White Seas; and *leucas* in the rest of the range. In the Pacific, belugas are common along Alaska as far south as Bristol Bay; the population found in Cook Inlet is apparently separate.

Abundance and Trends.—The population in the Soviet Arctic and Far East is estimated at between 32,000 and 58,000 (Yablokov, 1974). The population in the Canadian Arctic numbers at least 30,000 animals (Sergeant and Brodie, 1975). The Cook Inlet, Alaska, population is estimated at 300 to 500; in Bristol Bay the population is estimated at 1,000 to 1,500 and is considered stable; the size

of the beluga population in Alaska north of Bristol Bay is unknown, but is much greater than that residing in Bristol Bay (Alaska Department of Fish and Game, 1973). In Alaska belugas have been used as a source of muktuk meat and oil for both people and dogs by residents of villages on the Bering Sea and Arctic Ocean coasts and along rivers that belugas periodically ascend. Belugas also provide a significant amount of fresh and preserved food for native peoples in the MacKenzie River delta region and Baffin Island, where beluga hunting is culturally and economically important (Brodie, pers. comm.). In recent years the demand for beluga products has been reduced in the Arctic. In Bristol Bay only a few belugas are now taken, and the estimated annual harvest of the Bering Sea and Arctic Ocean coasts of Alaska is 150 to 300 (Alaska Department of Fish and Game, 1973). Sergeant (1962) states that from 1948 to 1960 the catch of belugas in the Canadian Arctic averaged 1,200 annually. The present catch in Canada averages 500 animals per year (Sergeant and Brodie, 1975). In the late 1950's the annual catch of belugas averaged 3,000 to 4,000 in the U.S.S.R., 500 to 800 in Greenland, and 100 to 200 from Spitsbergen (Kleinenberg, et al., 1964). Present catches in the Asian Arctic range from 530 to 825 annually.

General Biology.—Males grow to 4.6 m and the females to 4.0 m in the Beaufort Sea, and to 5.2 m and 4.6 m, respectively, in the Soviet Arctic. The beluga is polygamous, breeds in the spring, has a gestation period of 15 months, and newborn are about 1.5 m in length. Lactation lasts about 20 months, with a 3-year reproductive cycle. They are gregarious and travel in groups of 2 or 3 to hundreds. Belugas feed from midwater to the bottom, with a diet including fish such as salmon, capelin, cisco, pike, char, cod, squid, crustaceans, and nereid worms.

They frequently occur in shallow areas with a bottom of mud, sand, and stones. The beluga produces high-pitched whistles and squeals, ticking and clucking sounds, and have been given the name "sea-canary." Animals break the ice with their backs to reach air for breathing.

Parasites include nematodes in the respiratory organs, ears, circulatory system, intestine, and urogenital system; trematodes are found in the intestine, as well as cestodes and acanthocephalans. Helminths are apparently one cause of mortality.

Ecological Problems.—Known natural enemies include the killer whale and polar bear.

Allocation Problems.—These mammals take salmon at the mouths of large Alaskan rivers, and are important predators of salmon smolt in Bristol Bay, Alaska. Recorded killer whale sounds have been used experimentally to prevent beluga predation in the Kvichak River.

Current Research.—Research on the beluga is being conducted by the Fisheries Research Board of Canada.

REFERENCES

Alaska Department of Fish and Game. 1973. Marine mammal status reports. Unpublished, Juneau, AK.

Brodie, P. F. 1971. A reconsideration of aspects of growth, reproduction, and behavior of the white whale (*Delphinapterus leucas*), with reference to the Cumberland Sound, Baffin Island, population. J. Fish. Res. Bd. Can. 28(9):1309-1318.

Fish, J. F., and J. S. Vanla. 1971. Killer whale, *Orcinus orca*, sounds repel white whales, *Delphinapterus leucas*. Fish. Bull. 69:531-536.

Kleinenberg, S. E., A. V. Yablokov, B. M. Bel'kovich and M. N. Tarasevich. 1964. Beluga (*Delphinapterus leucas*) investigation of the species. Akad. Nauk SSSR. Transl. by IPST, Jerusalem, 1969.

Klinkhart, E. G. 1966. The beluga whale in Alaska. Unpublished report, Alaska Department of Fish and Game, Juneau, AK.

Sergeant, D. E. 1962. The biology and hunting of beluga or white whales in the Canadian Arctic. Fish. Res. Bd. Can. Circ. 8, 13 p.

Sergeant, D. E. 1973. Biology of white whales (*Delphinapterus leucas*) in western Hudson Bay. J. Fish. Res. Board Can. 30:1065-1090.

Sergeant, D. E., and P. F. Brodie. 1969. Body size in white whales, *Delphinapterus leucas*. J. Fish. Res. Bd. Can. 26:2561-2569.

Sergeant, D. E., and P. F. Brodie. 1975. Identity, abundance and present status of populations of white whales, *Delphinapterus leucas*, in North America. J. Fish. Res. Board Can. 32:1047-1054.

Yablokov, A. V. 1974. Present status of beluga and narwhal in USSR Arctic and Pacific waters. FAO/ACMRR Report, Doc. 39.

NARWHAL

(*Monodon monoceros*)

Distribution and Migration.—The narwhale is the most northern cetacean and occurs in north polar seas, mainly in the North Atlantic sector. It is most common in northwestern Greenland and the eastern Canadian Arctic, particularly Jones and Lancaster Sounds, the north and east coasts of Baffin Island, Repulse Bay, and occasionally in northern Foxe Basin and Hudson Strait. Narwhals also occur near Franz Josef Land and Novaya Zemlya. They are rare in the Laptev, East Siberian, Chukchi, and Beaufort Seas.

Abundance and Trends.—The Canadian and northwest Greenland population is at least 10,000 (Mansfield, 1975). Numbers elsewhere are unknown. Rare occurrences in Great Britain (4) and Holland (1) are documented. Narwhals are hunted in Greenland and the eastern Canadian Arctic for dog food, muktuk, sinew, and ivory.

General Biology.—Females attain a length of 400 cm and a weight of 900 kg. Each female bears a single calf about once every three years. Mating takes place in April, and the 1.5 m long young are born in July after a 14.5 month gestation period. Lactation probably lasts about 20 months. Narwhals are gregarious, forming schools of up to one or two thousand, and made up of small groups of up to about 20 (Mansfield, pers. comm.). Food of the narwhal consists mainly of cephalopods, Arctic cod, Greenland halibut, and shrimps.

Ectoparasitic whale lice occur in cuts, skinfolds, and around the base of the tusk. Endoparasitic nematodes occur occasionally in the stomach, and frequently in basiscranial sinuses.

Ecological Problems.—Narwhals are occasionally trapped in large numbers by rapid freeze-up. In such situations, Greenlanders may kill entire groups of these mammals. Although it is not adapted to drift ice areas, the killer whale probably occurs there and may be a natural enemy of the narwhal.

Allocation Problems.—None known.

Current Research.—The narwhal is being studied by the Fisheries Research Board of Canada.

REFERENCES

Best, R. C., and H. D. Fisher. 1974. Seasonal breeding of the narwhal (*Monodon monoceros* L.). Can. J. Zool. 53:429-431.

Degerbol, M., and P. Freuchen. 1935. Mammals: Report of the Fifth Thule Expedition, 1921-24. Vol. 2, Nos. 4 and 5. Nordisk Forlag, Copenhagen. 278 p.

Mansfield, A.W., T. G. Smith, and B. Beck. 1975. The narwhal, *Monodon monoceros*, in eastern Canadian waters. J. Fish. Res. Board Can. 32:1041-1046.

Peterson, R. L. 1966. The mammals of eastern Canada. Oxford Univ. Press, Toronto. 465 p.

Tomilin, A. G. 1957. Zverii SSSR i prilozheniya k nim. Tom 9. Kitobraznye. (Mammals of the U.S.S.R. and adjacent countries. Vol. IX. Cetacea.) Moscow, Akad. Nauk SSSR, 756 p. (Transl. by IPST, Jerusalem, 1967, xxiv plus 717 p.).

Vibe, C. 1950. The narwhal. P. 77-84 in The marine mammals and marine fauna in the Thule District (Northwest Greenland) with observations on ice conditions in 1939-41. Medd. om Gronland 150(6):1-116.

SPERM WHALE

(*Physeter catodon*)

Distribution and Migration.—The sperm whale is nearly worldwide in distribution except for the pack ice of the polar regions. Females and immature animals are generally found between 40°S and 50°N latitudes. Sperm whales appear to migrate north during the northern summer and south during the northern winter. In the North Pacific, male sperm whales are found as far north as the Bering and Okhotsk Seas; in the North Atlantic they move into Davis Strait and near Spitsbergen.

Abundance and Trends.—Information on this section is from the annual reports of the International Whaling Commission and from recent reports of the Bureau of International Whaling Statistics. The original world stock of exploitable males (i.e., males over the legal length limit of 30 feet) and sexually mature females was about 872 thousand, of which 49 percent were males. The present stock is about 590 thousand, of which only 35 percent are males. These are distributed by major ocean areas as follows:

Ocean	Original population	Current population
North Atlantic.....	1 (22?)	122
North Pacific.....	347	216
South Atlantic.....	112	80
Indian.....	157	109
South Pacific.....	245	174

¹ Estimate of total population, including immature animals. All figures in thousands.

² Not including central Indian Ocean.

The total populations, including immature animals, are roughly twice the above estimates.

The sperm whale is currently the most important species of the world whaling industry. Stocks in most areas are above maximum sustainable yield levels. Catches of sperm whales in recent seasons have been:

Season	North Pacific	Atlantic	Southern oceans, pelagic	Southern land stations
1970.....	14,815	649	5,861	4,135
1971.....	10,890	558	7,335	4,498
1972.....	6,323	117	8,172	2,695
1973.....	8,567	47	19,394	2,652
1974.....	8,127	171	8,980	12,891

¹ Revised.

² No data from Azores, or Madeira, or Spain.

³ No data from Chile.

In most areas, males comprise the majority of the catches, and in the Antarctic (south of 40° S lat.) the catch is almost exclusively males.

General Biology:

Species Statistics.—The sperm whale's large squarish head is distinctive because it bears a tank-like "case" containing spermaceti. The lower jaw is long and narrow, and has about 25 pairs of teeth. Females reach 11.6 m in body length, males 16.8 m.

Reproductive Data.—The females mature sexually about age 8 to 11 years when body length is about 8.5 to 9.1 m, physically at 25 to 30 years and body length of 11.0 m. Males are not sexually mature until about 10 years and 11.9 m, and are not "socially" mature until about age 25 years. Females and juveniles of both sexes form schools of 10 to 50 animals, averaging about 25. Younger, sexually mature males (ca. 11.0 to 13.4 m, age 15 to 25 years) form "bachelor" schools usually containing not more than 10 animals. Older males (13.7 m, 22 to 27 years) are usually solitary except when with schools of females for breeding for about 5 months in the spring and early summer. The female bears a calf (about 4.0 m) once every 3 to 5 years. Gestation last 14 to 15 months, and the calf nurses 1 to 2 years and is weaned at about 6.7 m long.

Age-Growth Data.—Newborn calves are about 3.5 to 5 m, and weigh about 1,000 kg. Growth of males continues until they are 45 to 60 years old, and about 15.5 m long.

Feeding Habits.—This species dives to at least 1,000 m, can remain submerged for about an hour, and feeds mainly on large squid. It also consumes significant quantities of octopuses and demersal and mesopelagic fishes.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—The National Marine Fisheries Service is studying the life history of the sperm whale. Other organizations carrying out research on this species are the Japanese Whales Research Institute and Japanese Far Seas Fisheries Research Laboratory (North Pacific and Antarctic). Fisheries Research Board of Canada (North At-

lantic), British National Institute of Oceanography (South Africa and western South America), South African Division of Sea Fisheries (South Africa), Australian Commonwealth Scientific and Industrial Research Organization (Australia), the University of Chile (Chile), the Marine Institute of Peru (Peru), and the Marine Department of New Zealand (New Zealand).

REFERENCES

Berzin, A. A. 1971. Kashalot. Izdatel'stvo. Pishchevaya Promyshlennost, Moscow. 368 p.

Best, P. B. 1967. The sperm whale (*Physeter catodon*) off the west coast of South Africa. 1. Ovarian changes and their significance. Invest. Rep. Div. Sea Fish. S. Afr. 61: 1-27.

— 1968. The sperm whale (*Physeter catodon*) off the west coast of South Africa. 2. Reproduction in the female. Invest. Rep. Div. Sea Fish. S. Afr. 66: 1-32.

— 1969. The sperm whale (*Physeter catodon*) off the west coast of South Africa. 3. Reproduction in the male. Invest. Rep. Div. Sea Fish. S. Afr. 72: 1-20.

— 1969. The sperm whale (*Physeter catodon*) off the west coast of South Africa. 4. Distribution and movements. Invest. Rep. Div. Sea Fish. S. Afr. 78: 1-12.

— 1970. The sperm whale (*Physeter catodon*) off the west coast of South Africa. 5. Age, growth and mortality. Invest. Rep. Div. Sea Fish. S. Afr. 79: 1-27.

Gambell, R. 1972. Sperm whales off Durban. Disc. Rep. 35: 199-358.

International Commission on Whaling. 1973. Twenty-third report of the Commission. International Commission on Whaling, Scientific Committee. 1971. Report of the special meeting on sperm whale biology and stock assessments, pp. 40-50 in Intl. Comm. Whaling, 21st Rep. Comm., London. Ohsumi, S. 1965. Reproduction of the sperm whale in the Northwest Pacific. Sci. Rep. Whales Res. Inst. 19: 1-35.

PYGMY SPERM WHALE

(*Kogia breviceps*)

Distribution and Migration.—The pygmy sperm whale occurs in all the warmer seas of the world. In the Pacific Ocean it ranges north to Washington and Japan; in the Atlantic Ocean it ranges north to Nova Scotia and the Netherlands. Its southern range limit is not well known.

Abundance and Trends.—The status of this species is unknown other than the fact that it is apparently rather rare. There are many more records of stranding than there are for *Kogia simus*, the dwarf sperm whale (C. O. Handley, Jr., pers. comm.). This species is occasionally taken in the Japanese small-whale fishery (Yamada, 1954).

General Biology.—Adult pygmy sperm whales are 2.7 to 3.4 m long. Their dorsal fin is low and posterior to the center of the back. This species was long confused with the dwarf sperm whale, and the following composite statement is based on both species. They are usually solitary or in small pods. They feed mostly on squid but also take pelagic crustaceans such as shrimps and giant mysids. Females simultaneously pregnant and lactating have been found,

suggesting that they may bear a calf 2 years in succession.

Parasites include tapeworm cysts in the blubber, roundworms in the stomach, and giant kidney worms.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—D. K. Caldwell and M. C. Caldwell have been gathering data on the life history in Florida (D. K. Caldwell, pers. comm., 1974). D. K. Caldwell, M. C. Caldwell, and C. O. Handley, Jr. have been working on the distribution (seasonal as well as geographical) in southeastern U.S. (Caldwell, pers. comm., 1974).

REFERENCES

Allen, G. M. 1941. Pygmy sperm whale in the Atlantic. Zool. Ser. Field Mus. Nat. Hist., 27: 17-36.

Handley, C. O., Jr. 1966. A synopsis of the genus *Kogia* (pygmy sperm whales). P. 62-69 in K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

Yamada, M. 1954. Some remarks on the pygmy sperm whale, *Kogia*. Sci. Rep. Whales Res. Inst., 9: 37-58.

NORTH SEA BEAKED WHALE

(*Mesoplodon bidens*)

Distribution and Migration.—The North Sea beaked whale ranges mostly from the western Baltic Sea and central Norway south to the Bay of Biscay. It has been recorded in the western North Atlantic Ocean from Newfoundland and Massachusetts. Its migrations are unknown.

Abundance and Trends.—The status of this species is unknown, except that it is apparently rare (Moore, 1966).

General Biology.—This species is the only one of its genus for which even rudimentary life history data are available. The beaked whales attain a maximum length of 5.5 m for males and 4.9 m for females. Mating and birth usually take place in late winter and spring. The gestation period is about 1 year. At birth the calf is between 1.8 and 2.1 m long, nurses for about 1 year, and at weaning is probably about 3.0 m long.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—None.

REFERENCES

Jonsgard, A., and P. Hoidal. 1957. Strandings of Sowerby's whale *Mesoplodon bidens* on the west coast of Norway. Norsk Hvalfangst-Tid., 46(9): 507-512.

Kukenthal, W. 1914. Zur Kenntnis des *Mesoplodon bidens* (Sowerby). Jenaische Z. Naturwiss., 51: 93-122.

Moore, J. C. 1966. Diagnoses and distribution of beaked whales of the genus *Mesoplodon* known from North American waters. P. 32-61 in K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

Nishiwaki, M., and N. Oguro. 1972. Catch of the Cuvier's beaked whales off Japan in recent years. Sci. Rep. Whales Res. Inst., 24: 35-41.

Omura, H., K. Fujino, and S. Kimura. 1955. Beaked whale *Berardius bairdi* of Japan, with notes on *Ziphius cavirostris*. Sci. Rep. Whales Res. Inst., 10: 89-132.

DWARF SPERM WHALE

(Kogia simus)

Distribution and Migration.—The dwarf sperm whale apparently has a discontinuous distribution around the world. It has been found in the seas adjacent to South Africa, India, Ceylon, Japan, Hawaii, South Australia, and the west and east coasts of the United States. On the west coast it has been recorded only from Cabo San Lazaro, Baja California, and San Luis Obispo County, California. On the east coast it ranges from Cape Henry, Virginia, south and west to Texas.

Abundance and Trends.—The status of this species is unknown other than the fact that it is apparently rather rare over much of its range. However, it strands rather frequently on the southeast coast of the United States and is taken in the Japanese small-whale fishery (Yamada, 1954).

General Biology.—Adult dwarf sperm whales are 2.1 to 2.7 m long. Their dorsal fin is high and near the center of the back. This species was long confused with the pygmy sperm whale, and the following is a composite statement based on both species. They are usually solitary or in small pods. They feed mostly on squid but also take pelagic crustaceans such as shrimps and giant mysids. Females simultaneously pregnant and lactating have been found, suggesting that they may bear a calf 2 years in succession.

Parasites include tapeworm cysts in the blubber, roundworms in the stomach, and giant kidney worms.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—D. K. Caldwell and M. C. Caldwell have been gathering data on the life history in Florida (D. K. Caldwell, pers. comm., 1974). D. K. Caldwell, M. C. Caldwell, and C. O. Handley, Jr. have been working on the distribution (seasonal as well as geographical) in southeastern U.S. (Caldwell, pers. comm., 1974).

REFERENCES

- Handley, C. O., Jr. 1966. A synopsis of the genus *Kogia* (Pygmy sperm whales), p. 62-69. In K. S. Norris (ed.), *Whales, dolphins, and porpoises*. Univ. Calif. Press, Berkeley and Los Angeles.
- Yamada, M. 1954. Some remarks on the pygmy sperm whale, *Kogia*. Sci. Rep. Whales Res. Inst. 9:37-58.

ANTILLEAN BEAKED WHALE

(Mesoplodon europaeus)

Distribution and Migration.—The Antillean beaked whale ranges from Trinidad, Jamaica, and the Gulf of Mexico, north to Long Island, New York. One record for the English Channel has been obtained. Its migrations are unknown.

Abundance and Trends.—The status of this species is unknown, except that it is apparently rare (Moore, 1966).

General Biology.—These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—None.

REFERENCES

- Moore, J. C. 1966. Diagnoses and distributions of beaked whales of the genus *Mesoplodon* known from North American waters. P. 32-61. In K. S. Norris (ed.), *Whales, dolphins, and porpoises*. Univ. Calif. Press, Berkeley and Los Angeles.

TRUE'S BEAKED WHALE

(Mesoplodon mirus)

Distribution and Migration.—The True's beaked whale has been found in the western North Atlantic Ocean from Nova Scotia south to Northern Florida, and in the eastern North Atlantic Ocean from the Outer Hebrides south along the west coast of Ireland. There is another population off the coast of South Africa. Its migrations are unknown.

Abundance and Trends.—The status of this species is unknown, except that it is apparently rare (Moore, 1966; 1968).

General Biology.—These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—None.

REFERENCES

- Moore, J. C. 1966. Diagnoses and distributions of beaked whales of the genus *Mesoplodon* known from North American waters. P. 32-61. In K. S. Norris (ed.), *Whales, dolphins, and porpoises*. Univ. Calif. Press, Berkeley and Los Angeles.
- 1968. Relationships among the living genera of beaked whales with classifications, diagnoses and keys. *Fieldiana: Zoology*, 53(4): 209-298.

BERING SEA BEAKED WHALE

(Mesoplodon stejnegeri)

Distribution and Migration.—The Bering Sea beaked whale is endemic to the North Pacific Ocean. It ranges from the Commander and Pribilof Islands, Bristol Bay, and the northern Gulf of Alaska south to the Sea of Japan on the western side and Oregon on the eastern side. Its migrations are unknown.

Abundance and Trends.—The status of this species is unknown, except that it is apparently rare (Moore, 1966; 1968).

General Biology.—These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—None.

REFERENCES

- Moore, J. C. 1963. Recognizing certain species of beaked whales of the Pacific Ocean. *Amer. Midl. Natur.* 70(2): 39-428.
- 1966. Diagnoses and distributions of beaked whales of the genus *Mesoplodon* known from North American waters. P. 32-61. In K. S. Norris (ed.), *Whales, dolphins, and porpoises*. Univ. Calif. Press, Berkeley and Los Angeles.

— 1968. Relationships among living genera of beaked whales with classifications, diagnoses and keys. *Fieldiana: Zoology*, 53(4): 209-298.

Nishimura, S., and M. Nishiwaki. 1964. Records of the beaked whale *Mesoplodon* from the Japan Sea. *Publ. Seto Mar. Biol.* (4): 323-334.

ARCH-BEAKED WHALE

(Mesoplodon carlhubbsi)

Distribution and Migration.—The arch-beaked whale has been recorded only in the North Pacific Ocean, from Sanriku coast of Hokkaido on the western side and from British Columbia south to southern California on the eastern side. Its migrations are unknown.

Abundance and Trends.—The status of this species is unknown, except that it is apparently rare (Moore, 1966; 1968).

General Biology.—These whales are known mostly from stranded individuals which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—None.

REFERENCES

- Moore, J. C. 1963. Recognizing certain species of beaked whales of the Pacific Ocean. *Amer. Midl. Natur.* 70(2): 39-428.
- 1966. Diagnoses and distributions of beaked whales of the genus *Mesoplodon* known from North American waters. P. 32-61. In K. S. Norris (ed.), *Whales, dolphins, and porpoises*. Univ. Calif. Press, Berkeley and Los Angeles.
- 1968. Relationships among living genera of beaked whales with classifications, diagnoses and keys. *Fieldiana: Zoology*, 53(4): 209-298.
- Pike, G. C., and I. B. MacAskie. 1969. Marine mammals of British Columbia. *F. Res. Bd. Can. Bull.* 171: 1-54.

GINKGO-TOOTHED WHALE

(Mesoplodon ginkgodens)

Distribution and Migration.—The ginkgo-toothed whale has been recorded from Ceylon, in the western North Pacific Ocean from Taiwan to the Sanriku coast of Hokkaido, and in the eastern North Pacific Ocean at Del Mar, southern California. Its migrations are unknown.

Abundance and Trends.—The status of this species is unknown, except that it may not be so rare in the western part of the North Pacific as once thought (Nishiwaki, et al., 1972).

General Biology.—These whales are known mostly from stranded individuals which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—None. Present knowledge is based on opportunistic examination of specimens.

REFERENCES

- Moore, J. C., and R. M. Gilmore. 1965. Beaked whale new to the western hemisphere. *Nature*, 205 (4977): 1239-1240.

Nishiwaki, M. and T. Kamiya. 1953. A beaked whale stranded at Ono Beach, Japan. Sci. Rep. Whales Res. Inst., 13: 53-63.

Nishiwaki, M., T. Kasuya, K. Kureha, and N. Ogura. 1977. Further comments on *Mesoplodon ginseng*. Sci. Rep. Whales Res. Inst. 24: 43-52.

DENSE-BEAKED WHALE

(*Mesoplodon densirostris*)

Distribution and Migration.—The dense-beaked whale is widely, but perhaps discontinuously, distributed in tropical and warm temperature waters around the world. In the North Pacific Ocean it has been recorded from Taiwan, Japan, and Midway Island. In the North Atlantic Ocean it has been recorded from Nova Scotia south to the Bahamas on the western side, and from Madeira on the eastern side.

Abundance and Trends.—The status of this species is unknown, except that it is apparently rare (Besharse, 1971; Moore, 1966).

General Biology.—These whales are known mostly from stranded individuals, which suggest that they are usually solitary. Otherwise, nothing is known of their biology.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—None.

REFERENCES

- Besharse, J. C. 1971. Maturity and sexual dimorphism in the skull, mandible, and teeth of the beaked whale, *Mesoplodon densirostris*. J. Mammal. 52:297-315.
- Moore, J. C. 1966. Diagnoses and distributions of beaked whales of the genus *Mesoplodon* known from North American waters. P. 32-61 In K. S. Norris (ed.), Whales, dolphins, and porpoises. Univ. Calif. Press, Berkeley and Los Angeles.

GOOSE-BEAKED WHALE

(*Ziphius cavirostris*)

Distribution and Migration.—The goose-beaked whale is found in all oceans except Arctic and Antarctic waters. In the North Pacific Ocean it ranges north to Hokkaido, the Commander and Aleutian Islands, and the Queen Charlotte Islands. In the North Atlantic Ocean it ranges north to Cape Cod, Massachusetts, on the western side and the Shetland and Orkney Islands on the eastern side. Its migrations are not understood.

Abundance and Trends.—The status of this species is unknown. The goose-beaked whale is the most frequently observed ziphiid, at least in the eastern North Pacific Ocean, and throughout its range has been found stranded far more often than any other species of the family (Mitchell, 1968). Between 13 and 16 goose-beaked whales have been taken annually in the Japanese small-whale fishery during the past 5 years (Nishiwaki and Oguro, 1972).

General Biology.—The goose-beaked whale is distinguishable from other ziphiids by its relatively short beak, the dorsal profile of which forms an almost straight line with the steeply sloping forehead, and by its brown coloration; older males have snow-white heads. The maximum body length in both sexes is

about 7.0 m. These whales usually travel in tight schools of up to about 10 individuals, but old males are often solitary. Their main foods are squids and deepwater fishes. Sexual maturity is attained at a length of about 5.5 m in both sexes.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—Research on this species has been conducted incidentally to other studies in Japan by the Whales Research Institute and the Ocean Research Institute.

REFERENCES

- Mitchell, E. 1968. Northeast Pacific stranding distribution and seasonality of Cuvier's beaked whale *Ziphius cavirostris*. Can. J. Zool., 46:265-279.
- Nishiwaki, M., and N. Oguro. 1972. Catch of Cuvier's beaked whales off Japan in recent years. Sci. Rep. Whales Res. Inst. No. 24. p. 35-41.

GIANT BOTTLENOSE WHALE

(*Berardius bairdi*)

Distribution and Migration.—The giant bottlenose whale is endemic to the North Pacific Ocean, where it ranges from St. Matthew Island in the Bering Sea south to central Honshu on the western side and southern California on the eastern side. Its migrations are poorly known.

Abundance and Trends.—The status of this species is unknown except that it is uncommon but not rare. According to information taken from the Bureau of International Whaling Statistics, between 100 and 400 giant bottlenose whales have been taken annually in the Japanese small-whale fishery during the past 20 years.

General Biology.—This species is the largest of the beaked whales. Males attain a maximum length of 11.9 m and females 12.8 m. Their long narrow beak, bulging forehead, and size distinguish them from other species of beaked whales in the North Pacific Ocean. They usually travel in tight schools of up to 30 individuals. Their main foods are deep-water fishes and squids. Males attain sexual maturity at a length of about 10.0 m, and females at about 10.3 m. Sexual maturity is not attained earlier than age 3 years, and probably much later. Mating takes place mostly in February, and calves are born in December.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—Research on this species has been conducted incidentally to other studies in Japan by the Whales Research Institute and the Ocean Research Institute; in California by the National Marine Fisheries Service; and in British Columbia by the Fisheries Research Board of Canada.

REFERENCES

- Betesheva, E. I. 1960. Pitaniye kashalota (*Physeter catodon* L.) i berardiusa (*Berardius bairdi* Stejneger) v Balone Kuril'skoi gryady. Trudy Vses. Gidrobiol. Obshch. 10:227-234.

Bureau of International Whaling Statistics. 1952-1972. International Whaling Statistics.

Nishiwaki, M., and N. Oguro. 1971. Baird's beaked whales caught on the coast of Japan in recent 10 years. Sci. Rep. Whales Res. Inst. 23:111-122.

Omura, H., K. Fujino, and S. Kimura. 1955. Beaked whales *Berardius bairdi* of Japan, with notes on *Ziphius cavirostris*. Sci. Rep. Whales Res. Inst., 10:89-132.

NORTH ATLANTIC BOTTLENOSE WHALE

(*Hyperoodon ampullatus*)

Distribution and Migration.—This species of bottlenose whale is endemic to the colder waters of the North Atlantic Ocean. On the western side it ranges from Davis Strait south to Rhode Island; on the eastern side it ranges from Novaya Zemlya south to the Azores and English Channel. It migrates south in the autumn and north in the spring.

Abundance and Trends.—The initial population in all waters east of Greenland is estimated to have been between 40,000 and 100,000; by 1915 it was reduced to about half its initial size (Christensen, 1974). It is not known whether it has since increased. Norwegian catches in the North Atlantic ranged from 2,000 to 3,000 annually between 1890 and 1900. Catches ranged from 20 to 100 per year from 1920 to 1954. From 1955 to 1971, a few hundred have been caught annually, peaking at about 700 in 1965. Catches have been near zero since then. A few individuals are sometimes taken by whalers operating from Nova Scotia and the Faeroe Islands.

General Biology.—The bottlenose whale is easily recognized by a conspicuous beak that is sharply demarked from the high bulging forehead which, in old males, becomes almost vertical and flattened in front and slightly overhangs the base of the beak. Bottlenose whales are black when young, turn brown when adult, and almost yellow with a white head when very old. Males attain a maximum length of 10.7 m, and females 9.7 m. Females attain sexual maturity at about 9 years, males at 9 to 11 years. Mating occurs in April, and the 3.0 m calf is born about 12 months later. Bottlenose whales usually travel in small herds of 4 to 10, but the adult males are often by themselves. Their food appears to be mainly squids. Females attain sexual maturity when about 6.5 m long. The calves are born from early spring to early summer.

Ecological Problems.—None known.

Allocation Problems.—None known.

Current Research.—This species is being studied by the Statens Institute for Hvalforskning, Oslo, Norway.

REFERENCES

- Bureau of International Whaling Statistics. 1936-1972. International Whaling Statistics.
- Benjaminsen, T. 1972. On the biology of the bottlenose whale, *Hyperoodon ampullatus* (Forster). Norw. J. Zool. 20:233-241.

1973. Age determination, age structure, and growth of bottlenose whale (*Hyperoodon ampullatus* (Forster)), in the Labrador Sea. *Norw. J. Zool.* 21:331-340.

1974. The history of exploitation and the initial status of the northeast Atlantic bottlenose whale (*Hyperoodon ampullatus*). FAO/ACMRR, Report, Doc. 21, 23 p.

Gray, D. 1852. Notes on the characters and habits of the bottlenose whale (*Hyperoodon rostratus*). *Proc. Zool. Soc., London*, 1852:725-731.

Jonsgard, A. 1952. Om bottlenosen (*Hyperoodon rostratus*) og spekkoggeren (*Orcinus orca*). *Fauna* (1):1-18.

Murray, J., and J. Hjort. 1912. The depths of the ocean. McMillan and Co., London, 821 p.

CONTRIBUTORS OUTSIDE THE DEPARTMENT OF COMMERCE TO THE STATUS OF STOCKS REPORT

Brodie, Paul F., Fisheries Research Board of Canada, Marine Ecology Laboratory, Bedford Institute, Dartmouth, Nova Scotia, Canada.

Brooks, James W., Alaska Department of Fish and Game, Subpost Building, Juneau, AK 99801.

Brownell, Robert L., Jr., Division of Mammals, National Museum Natural History, Smithsonian Institution, Washington, DC.

Burns, John J., Alaska Department of Fish and Game, 1300 College Road, Fairbanks, AK 99701.

Caldwell, David K., Communication Sciences Laboratory, Route 1, Box 122, St. Augustine, FL 32804.

Caldwell, Melba C., Communication Sciences Laboratory, Route 1, Box 122, St. Augustine, FL 32804.

Carlisle, John G., California State Fisheries Laboratory, Marine Resources Region, 350 Golden Shore, Long Beach, CA 90802.

Chapman, Douglas G., College of Fisheries, University of Washington, Seattle, WA 98195.

Drury, William H., Massachusetts Audubon Society, Lincoln, MA 01773.

Durham, Floyd, Department of Biology, University of Southern California, Los Angeles, CA 90007.

Evans, William E., Naval Undersea Research and Development Center, San Diego, CA 92132.

Fay, Francis H., University of Alaska, College, AK 99701.

Gates, Doyle, California Department of Fish and Game, Marine Resources Region, 350 Golden Shore, Long Beach, CA 90802.

Handley, Charles O., Jr., Department of Vertebrate Zoology, Smithsonian Institution, Washington, DC 20560.

Houck, Warren J., Division of Biological Sciences, Humboldt State University, Arcata, CA 95521.

Kenyon, Karl W., 11964 Lakeside Place N.E., Seattle, WA 98125.

Leatherwood, J. Stephen, Marine Life Sciences Laboratory, Naval Undersea Research and Development Center, San Diego, CA 92132.

Mansfield, Arthur W., Arctic Biological Station, Fisheries Research Board of Canada, P.O. Box 400, Ste. Anne de Bellevue, P.Q., Canada.

Mead, James G., Smithsonian Institution National Museum of Natural History, Washington, DC 20560.

Norris, Kenneth S., University of California at Santa Cruz, Santa Cruz, CA 95060.

Ray, G. Carleton, Department of Pathobiology, Johns Hopkins University, 615 North Wolfe Street, Baltimore, MD 21205.

Scheffer, Victor B., 14806 S.E. 54th St., Bellevue, WA 98006.

Siniff, Don B., Department of Ecology and Behavior, Minnesota Museum of Natural History, University of Minnesota, Minneapolis, MN. Marine Mammal Studies, Alaska Department of Fish and Game, 1018 International Airport Road, Anchorage, AK 99507.

Ximenez, Ismael, SOYP Depto Cientifico y Tecnico del Mar, Oceanografico y de Pesca, P.O. Box 1400, Montevideo, Uruguay.

LAWS AND TREATIES GOVERNING THE PROTECTION OF MARINE MAMMALS

Each marine mammal of U.S. concern is protected by one or more U.S. laws or acts, and the conservation of some species is at least partially assured by international treaty or law. A summary of the various laws, conventions, and commissions designed and enacted to protect marine mammals follows:

1. *Marine Mammal Protection Act of 1972*.—A U.S. Federal law that prohibits U.S. citizens from taking, harassing, or importing any marine mammal or its byproducts into the United States, except when authorized to do so by special permit. Indians, Eskimos, and Aleuts of the North Pacific and Arctic Oceans can take marine mammals for subsistence, and for creating and selling handicraft items and clothing as long as the stocks can support the harvest.

2. *Endangered Species Act of 1973*.—The purposes of this U.S. Federal law, which became effective December 28, 1973, are to provide a program for the conservation of species that are either endangered (presently) or threatened (within the foreseeable future) with extinction and their dependent ecosystems, and implement certain international conservation conventions (including the Convention on International Trade in Endangered Species of Wild Fauna and Flora). The primary objective is to bring these species to the point at which they are no longer in danger of extinction. The Act prohibits taking (e.g. killing, capturing, harassing), importing, exporting, and interstate commerce, involving endangered species and authorizes protective regulations for threatened species. Controls affect parts and products as well as live animals. The Act also provides limited exceptions to these prohibitions for, among other things, certain subsistence taking in Alaska and permits to allow scientific purposes, enhancement of propagation, and survival of the species.

3. *International Whaling Convention*.—The International Whaling Commission was established under a convention signed in Washington, D.C. in December 1946. The membership includes all countries that catch significant numbers of whales except Spain, Portugal, Chile, Peru, and Brazil. The IWC is responsible for whale conservation worldwide. Since 1964, the IWC has acted to bring world whaling under control by prohibiting worldwide the taking of some species, sharply reducing the authorized catches of species in certain areas, establishing catch quotas by species, and implementing an international observer plan for policing quotas and regulations

at land stations and on factory ships. The IWC appears to be extending its authority to cover all cetaceans and to implement regulations for threatened species. The IWC now regulates the harvest of fin, sei, Bryde's, minke, and sperm whales. A subcommittee of the IWC may be established to improve data collection on small cetaceans and review problems. The gray, bowhead, right, blue, and humpback whales are completely protected, except for some hunting by aboriginals.

4. *International Convention on Trade in Endangered Species of Wild Fauna and Flora*.—When this convention becomes effective, it will provide additional protection for the following species: Appendix I—gray, blue, humpback, bowhead, and right whales, northern elephant seal, Ganges River dolphin, Caribbean and Mediterranean monk seal, dugong, and West Indian and South American manatees; Appendix II—southern elephant seal, southern fur seal, Galapagos fur seal, Juan Fernandez fur seal, Guadalupe fur seal, dugong (Australian), and West African manatee.

5. *Interim Convention on North Pacific Fur Seals*.—This convention prohibits most citizens of Japan, Canada, the U.S.S.R., and the United States from taking northern fur seals. The exceptions are aboriginal Indians, Aleuts, and Eskimos, who may take them only at sea and by primitive methods. The convention also provides for intensive research on this species by the four countries. The economic utilization of northern fur seal on their breeding grounds is conducted by the respective governments and regulated on a scientific basis.

6. *International Convention for the Northwest Atlantic Fisheries*.—Under terms of a convention signed in 1941 ICNAF is responsible for the investigation, protection, and conservation of the fisheries of the Northwest Atlantic in order to make possible the maintenance of a maximum sustained catch from these fisheries. The harp seal harvest regulated by ICNAF, which imposes quotas for the taking of these mammals.

7. *International Convention for the Conservation of Antarctic Seals, 1972*.—The purpose of this convention is to safeguard all species of Antarctic seals and to ensure that, if commercial sealing begins on floating ice of the Southern Ocean, the killing of certain species will be prohibited and the taking of other species will be subject to strict limitations. Measures adopted under the Antarctic Treaty of 1959 provide only for the protection of seals and other animals around the shoreline of the Antarctic Continent, but not on floating ice. The convention of 1972 may be applicable to any or all of the following seals: southern elephant, leopard, Weddell, crabeater, Ross, and southern fur seals.

8. *Canadian-Norwegian Agreement on Sealing*.—On December 22, 1971, the two governments ratified an agreement on sealing and the conservation of stocks in the Northwest Atlantic. The agreement applies to the harp seal, b

provision is made for extension to hooded and bearded seals and to the walrus.

9. Miscellaneous regulations and agreements of some U.S. interest:

a. Harp seal—The U.S.S.R. and Norway signed an agreement in 1966 entitled "Preservation of Seals in the Greenland Sea." The agreement provides for the regulation of harp seal catches by these two nations. The U.S.S.R., however, has not hunted harp seals since 1965.

b. Gray seal—The U.S.S.R. has prohibited (since 1970) the hunting of gray seals for sport and by amateurs, but permits the taking of these animals for subsistence. Canada uses an 1886 law for authority in regulating the take of gray seals. England has prohibited the hunting of gray seals on the Farne Islands since 1932 and on Orkney Island since 1923. Norway has forbidden hunting at Sör Trondelag (since 1923). Finland and Sweden offer bonuses for gray seals taken.

c. Hooded seal—Canada and Norway prohibit the taking of hooded seals near Newfoundland before 10 March, near Jan Mayen Island before 13 March, in Denmark Strait from 15 June to 15 July, and in northern waters from 20 March to 5 May. The U.S.S.R. and Norway in 1958 agreed to prohibit the harvest of hooded seals near Jan Mayen Island before 13 March, and banned hunting in Denmark Strait.

d. Bearded seal—The U.S.S.R. has, since 1970, banned the commercial hunting of bearded seals from vessels, and regulates the take of this species by aborigines and the harvest from shore by others.

e. Ribbon seal—Since the 1960's, the U.S.S.R. has forbidden the hunting of ribbon seals at sea from 1 March to 1 September, and in 1970 stopped hunting by amateurs.

f. Ringed seal—The U.S.S.R. banned sport hunting of *Pusa hispida hispida* beginning in 1970. Sport hunting of another subspecies (apparently accepted by the U.S.S.R. as *P. h. krascheninikovi*) was also banned by the U.S.S.R. In that year, local harvests were regulated, and hunting of the subspecies between 1 March and 1 September was prohibited. The U.S.S.R. has also, since 1970, prevented commercial hunting of *P. h. ochotensis* from vessels, and regulated the take of this subspecies by aborigines and the harvest from shore by others.

g. Harbor seal—Ice-dwelling populations—The U.S.S.R. has prohibited sport hunting of these populations of the harbor seal since 1970, protects its rookeries from harassment and pollution, and regulates the harvest. Land-dwelling populations—The U.S.S.R. has prohibited the sport hunting of these populations since 1970, and regulates the take of harbor seals from the White and Barents Seas.

h. Northern sea lion—The U.S.S.R. regulates the harvest of northern sea lions and protects its rookeries from harassment.

i. Walrus—In 1958, the U.S.S.R. and Norway agreed to ban the hunting of walrus except to satisfy local needs and those of expeditions.

j. Guadalupe fur seal—Mexico has safeguarded the breeding grounds of the Guadalupe fur seal on the Guadalupe Islands by making this island a wildlife refuge.

k. South American fur seal—The Uruguayan and Argentinian Governments protect the South American fur seal on land and out to 200 miles at sea. In addition, the Uruguayan Government regulates the harvest by protecting all female seals except the 1-year-olds, controlling take of pups by season restrictions, and imposing quotas in some instances.

l. South African fur seal—The harvest of South African fur seals is largely a state enterprise in South Africa, however, the system includes one of control and leasing of rookeries to private contractors. The South West African Administration has not entered the harvesting business, but licenses private firms, restricts gear to be used, establishes closed seasons, and places limits on sex and condition of catch.

m. Narwhal—Canada allows its Eskimos to take five narwhals annually for personal use and issues permits to capture this mammal for exhibition.

n. Killer whale—Canada allows this species to be taken under a permit system.

PART III.—APPENDICES

APPENDIX A.—TABLES

Table I.—Common and Scientific Names of Marine Mammals Involved in Scientific Research/Public Display Permit Applications

Table II.—Synopsis of Permit Applications

Table III.—Number of Cetaceans Requested in Scientific Research/Public Display Permit Applications

Table IV.—Number of Pinnipeds Requested in Scientific Research/Public Display Permit Applications

Table V.—Number of Cetaceans Authorized to be Taken or Imported under Scientific Research/Public Display Permits; and

Table VI.—Number of Pinnipeds Authorized to be Taken or Imported Under Scientific Research/Public Display Permits

APPENDIX B.—PERMIT ISSUANCE POLICIES

1. Policy To Establish a Standardized Procedure Concerning the Processing of Applications for Permits and the Suspension of Activities Pursuant to Existing Permits: FEDERAL REGISTER reference, 40 F.R. 24948.

2. Prohibitions Contained in Section 102(b) Would Be Considered in Connection With Permits, Waivers, and Foreign Programs: FEDERAL REGISTER reference, 40 F.R. 17845.

APPENDIX C.—REGULATIONS ON INCIDENTAL TAKING IN THE COURSE OF COMMERCIAL FISHING OPERATIONS

1. September 5, 1974: FEDERAL REGISTER reference, 39 F.R. 32117.

2. September 20, 1974: FEDERAL REGISTER reference, 39 F.R. 33801.

3. September 25, 1974: FEDERAL REGISTER reference, 39 F.R. 34417.

4. January 3, 1975: FEDERAL REGISTER reference, 40 F.R. 764.

APPENDIX D

Amendment to Regulations on Incidental Taking in the Course of Commercial Fishing Operations, December 5, 1975: FEDERAL REGISTER reference, 40 F.R. 56899.

APPENDIX E

Methodology for Comparing 1975 and 1976 Porpoise Mortality in the Yellowfin Tuna Purse Seining Fishery, April 5, 1976: FEDERAL REGISTER reference, 41 F.R. 14401.

APPENDIX F

Notice of Hearing to Waive the Moratorium to Allow Importation of Fur Sealskins From South Africa, July 7, 1975: FEDERAL REGISTER reference, 40 F.R. 28469.

APPENDIX G

Amendment to Regulations Governing the Taking and Importing of Marine Mammals, Regarding Penalties and Procedures For Their Assessment, November 24, 1975: FEDERAL REGISTER reference, 40 F.R. 54427.

APPENDIX H

Table: Marine Mammal Conservation—Status of Authorization+Funding—FY 1976+1977.

APPENDIX A

TABLE I.—Common and scientific names of marine mammals involved in scientific research/public display permit applications

Common name	Scientific name
Cetaceans	
Black Right Whale.....	<i>Balaena glacialis</i>
Bowhead Whale.....	<i>Balaena mysticetus</i>
Gray Whale.....	<i>Eschrichtius robustus</i>
Mink Whale.....	<i>Balaenoptera acutorostrata</i>
Bryde's Whale.....	<i>Balaenoptera edeni</i>
Sa Whale.....	<i>Balaenoptera borealis</i>
Fin Whale.....	<i>Balaenoptera physalus</i>
Blue Whale.....	<i>Balaenoptera musculus</i>
Humpback Whale.....	<i>Megaptera noronae</i>
Rough-toothed Dolphin.....	<i>Seno bredanensis</i>
Bottlenosed Dolphins.....	<i>Tursiops sp.</i>
Atlantic Bottlenosed Dolphin.....	<i>Tursiops truncatus</i>
Pacific Bottlenosed Dolphin.....	<i>Tursiops gilli</i>
Risso's Dolphin.....	<i>Grampus griseus</i>
Lagenorhynchine Dolphins.....	<i>Lagenorhynchus sp.</i>
White-barked Dolphin.....	<i>Lagenorhynchus albirostris</i>
Atlantic White-sided Dolphin.....	<i>Lagenorhynchus acutus</i>
Pacific White-sided Dolphin.....	<i>Lagenorhynchus obliquidens</i>
Dusky Dolphin.....	<i>Lagenorhynchus obscurus</i>
Fraser's (Sarawak) Dolphin.....	<i>Lagenodelphis hosei</i>
Stenelline Dolphins.....	<i>Stenella sp.</i>
Spinner Dolphin.....	<i>Stenella longirostris</i>
Spotted Dolphin.....	<i>Stenella attenuata</i>
Striped Dolphin.....	<i>Stenella coeruleoalba</i>
Common Dolphin.....	<i>Delphinus delphis</i>
Northern Right Whale Dolphin.....	<i>Lissodelphis borealis</i>
Melon-headed Whale.....	<i>Peponocephala electra</i>
Pygmy Killer Whale.....	<i>Feresa attenuata</i>
False Killer Whale.....	<i>Pseudorca crassidens</i>
Pilot Whales.....	<i>Globicephala sp.</i>
Long-finned Pilot Whale.....	<i>Globicephala melanena</i>
Short-finned Pilot Whale.....	<i>Globicephala macrorhynchus</i>
Killer Whale.....	<i>Orcinus orca</i>
Harbor Porpoise.....	<i>Phocoena phocoena</i>
Cochito.....	<i>Phocoena sinuata</i>
Dall's Porpoise.....	<i>Phocoenoides dalli</i>
White Whale (Belukha, Beluga Whale).....	<i>Delphinapterus leucas</i>
Sperm Whale.....	<i>Phuaptera catodon</i>
Pygmy Sperm Whale.....	<i>Kogia breviceps</i>
Hubb's Beaked Whale.....	<i>Mesoplodon carlhubbsi</i>
Cuvier's Beaked Whale.....	<i>Ziphius cavirostris</i>
Bottlenose Whales.....	<i>Hyperoodon sp.</i>

Pinnipeds	
South American Sea Lion	<i>Urocyon v. v.</i>
California Sea Lion	<i>Urocyon californicus</i>
Northern (Stellar) Sea Lion	<i>E. m. subsp. jubatus</i>
Antarctic Fur Seal	<i>A. m. subsp. pusillus</i>
South African Fur Seal	<i>A. m. subsp. pusillus</i>
Northern Fur Seal	<i>Urocyon v. v.</i>
Pacific Harbor Seal	<i>Phoca vitulina richardi</i>
Ice-breeding Harbor Seal	<i>Phoca vitulina largha</i>
Atlantic Harbor Seal	<i>Phoca vitulina vitulina</i>
Western N. Atlantic Harbor Seal	<i>Phoca vitulina concolor</i>
Ringed Seal	<i>Pusa (Phoca) hispida</i>
Gray Seal	<i>Halichoerus grypus</i>
Ribbon Seal	<i>Heterophoca fasciata</i>
Bearded Seal	<i>Erignathus barbatus</i>
Hawaiian Monk Seal	<i>Monachus schauinslandi</i>
Crab-eater Seal	<i>Lobodon carcinophagus</i>
Ross Seal	<i>Ommatophoca rossi</i>
Leopard Seal	<i>Hydrurga leptonyx</i>
Weddell Seal	<i>Leptonychotes weddellii</i>
Southern Elephant Seal	<i>Mitrona leonina</i>
Northern Elephant Seal	<i>Mitrona angustirostris</i>

TABLE II.—Synopsis of permit applications

	As of Mar. 31, 1975		Apr. 1, 1975 to Mar. 31, 1976		As of Mar. 31, 1976
	Scientific research	Public display	Scientific research	Public display	Cumulative total
Number of applications submitted.....	54	85	22	14	176
Number of animals requested:					
Taken by killing.....	2,421	0	1,280	0	4,701
Taken and kept alive.....	282	594	18	62	956
Killed in captivity..... ¹	20(30)	0	37	0	57(30)
Taken and released.....	19,534	0	31,316	0	50,850
Found dead.....	732	50	570	0	1,351
Total.....	24,019	644	33,221	62	57,946
ACTION TAKEN					
Number of applications forwarded to Marine Mammal Commission.....	48	85	25	19	155
Number of applications reviewed by Marine Mammal Commission.....	45	81	20	20	146
Number of applications withdrawn.....	2	6	1	0	12
Number of applications referred to States.....	2	1	0	0	4
Number of applications resolved through interagency agreement.....	1	0	0	0	1
Number of applications returned due to in- appropriate submittal.....	0	5	0	0	5
Number of applications inactivated.....	1	4	0	1	6
Number of applications denied.....	2	4	0	1	7
Number of applications approved.....	40	45	20	22	127
Number of animals approved:					
Taken by killing.....	2,386	0	611	0	3,007
Taken and kept alive.....	288	262	45	70	615
Killed in captivity..... ²	12(30)	0	37	0	49(30)
Taken and released.....	19,029	0	25,940	0	44,978
Found dead.....	732	0	40	0	772
Total.....	23,397	262	30,632	70	50,411

¹ Included in the application totals above are 21 applications in which no numbers of animals are specified. The total number of animals requested, therefore, does not include the animals which would be taken under these applications.

² In some cases, permit applications and permits specify alternate means of taking, which fall into more than 1 taking category. The taking category, species and cumulative totals, in such cases, are entered under 1 alternate category, and are indicated, in parentheses, under the other alternate category. The parenthetical entries are not included in the totals.

TABLE III.—Number of cetaceans requested in scientific research/public display permit applications

Common name ¹	Requested (as of Apr. 30, 1975)					Requested (Apr. 1, 1975 through Mar. 31, 1976)					Cumulative total requested
	Taken by killing	Taken and kept alive	Killed in captivity	Taken and released	Found dead	Taken by killing	Taken and kept alive	Killed in captivity	Taken and released	Found dead	
Black right whale				525					120		645
Howhead whale				50	40				80		170
Gray whale				34	11				290		335
Minke whale				649	3				710		1,362
Bryde's whale				550					380		930
Fei whale				600					325		925
Fin whale				575					300		875
Blue whale				525					100		625
Humpback whale				545	10				230	20	805
Rough-toothed dolphin		7		100							107
Bottlenosed dolphins									50		50
Atlantic bottlenosed dolphin		227		474			15		150		866
Pacific bottlenosed dolphin		27			3				130		155
Risso's dolphin		2		24					150		174
Lagenorhynchine dolphins									50		50
White-beaked dolphin				24							24
Atlantic white-sided dolphin		6		24							30
Pacific white-sided dolphin		17		191	3		6		330		547
Dusky dolphin				61							61
Fraser's dolphin				100							100
Stenelline dolphins				24					150		174
Spinner dolphin		17		1,500					3,000		4,517
Spotted dolphin				1,500	3				7,000		8,503
Striped dolphin				100							100
Common dolphin		6		631	3				380		1,020
Northern right whale dolphin		2			3				130		135
Melon-headed whale				100							100
Pygmy killer whale		4		100							104
False killer whale		7		24					50		81
Pilot whales									160		160
Long-finned pilot whale		2		24	60						86
Short-finned pilot whale		22		44	3		1				70
Killer whale		8		84	23				50		165
Harbor porpoise					3				50		53
Cochito					2						2
Dall's porpoise					3				330		333
White whale	55	4			50				750		109
Sperm whale				725							1,475
Pygmy sperm whale					3						3
Hubb's beaked whale					3						3
Cuvier's beaked whale		2									2
Bottlenose whales				25							25
Total ²	55	329		5,967	229	22			14,255	20	20,877

¹ Please refer to table I of this appendix, entitled "Common and Scientific Names of Marine Mammals Involved in Scientific Research/Public Display Permit Applications," for the appropriate scientific names.

² In some cases, permit applications or permits specify a number of animals to be taken, without specifying the numbers to be taken from a particular species or population stock. Therefore, the figures given for a particular species represent the total number of animals which might be taken if all possible alternatives were selected for that species. However, the total number given for a category of taking activity represents the maximum number of animals which might be taken, discounting any multiple takings arising from the identification of more than 1 species. As a result, taking category totals may be less than the sum of the individual entries for that category.

TABLE IV.—Number of pinnipeds requested in scientific research/public display permit applications

Common name ¹	Requested (as of Mar. 30, 1975)					Requested (Apr. 1, 1975 through Mar. 31, 1976)					Cumulative total requested
	Taken by killing	Taken and kept alive	Killed in captivity	Taken and released	Found dead	Taken by killing	Taken and kept alive	Killed in captivity	Taken and released	Found dead	
South American sea lion		9									9
California sea lion	600	386		1,030	243				6		2,313
Northern (Stellar) sea lion	180		(10)	3,000	3	450			9,500		13,133
Antarctic fur seal	8			100						550	658
South African fur seal											0
Northern fur seal					3						15
Pacific harbor seal	516	197	20(30)	660	3	430	12				1,336
Ice-breeding harbor seal	70	6	(30)	300		100	10				476
Atlantic harbor seal		1									1
Western North Atlantic harbor seal		33		145	20		2				200
Ringed seal	1,120	4	(30)		25	100					1,249
Gray seal		28									28
Ribbon seal	40		(10)			100					140
Bearded seal	790		(10)		10	100					900
Hawaiian monk seal		2									2
Crab-eater seal	24			300							324
Ross seal	8			100					6		114
Leopard seal	24	2		200							226
Weddell seal	48			3,596				37	39		3,720
Southern elephant seal	8			100							108
Northern elephant seal		135		4,036	276		6		5,010		9,463
Total ²	3,366	547	20(30)	13,567	583	1,280	58	37	17,061	550	37,099

¹ Please refer to Table I of this Appendix, entitled "Common and Scientific Names of Marine Mammals Involved in Scientific Research/Public Display Permit Applications," for the appropriate scientific names.

² In some cases, permit applications or permits specify a number of animals to be taken, without specifying the numbers to be taken from a particular species or population stock. Therefore, the figures given for a particular species represent the total number of animals which might be taken if all possible alternatives were selected for that species. However, the total number given for a category of taking activity represents the maximum number of animals which might be taken, discounting any multiple takings arising from the identification of more than one species. As a result, taking category totals may be less than the sum of the individual entries for that category.

³ In some cases, permit applications or permits specify alternate means of taking, which fall into more than one taking category. The taking category, species and cumulative totals, in such cases, are entered under one alternate category, and are indicated, in parentheses, under the other alternate. The parenthetical entries are not included in the totals.

TABLE V.—Number of cetaceans authorized to be taken or imported under scientific research/public display permits

Common name ¹	Authorized (as of Mar. 31, 1975)					Authorized (Apr. 1, 1975 through Mar. 31, 1976)					Cumulative total authorized ²
	Taken by killing	Taken and kept alive	Killed in captivity	Taken and released	Found dead	Taken by killing	Taken and kept alive	Killed in captivity	Taken and released	Found dead	
Black right whale											0
Bowhead whale					40				50		90
Gray whale				0	10				200		210
Minke whale				124					650		774
Bryde's whale				50					300		350
Sel whale				75					255		330
Fin whale				50					180		230
Blue whale									30		30
Humpback whale									30	20	50
Rough-toothed dolphin		7		100							107
Bottlenosed dolphins								32			0
Atlantic bottlenosed dolphin		106		474					130		612
Pacific bottlenosed dolphin		14							100		144
Risso's dolphin				24							124
Lagenorhynchine dolphins											0
White-beaked dolphin				24							24
Atlantic white-sided dolphin		6		24							30
Pacific white-sided dolphin		6		191			9		330		536
Dusky dolphin				61							61
Fraser's dolphin				100							100
Stenelline dolphins				24					100		124
Spinner dolphin		11		1,500					3,000		4,511
Spotted dolphin				1,500					7,000		8,500
Striped dolphin				100							100
Common dolphin		6		631					330		967
Northern right whale dolphin									130		130
Melon-headed whale				100							100
Pygmy killer whale				100							100
False killer whale		5		24							29
Pilot whales									110		110
Long-finned pilot whale				24	60			2			86
Short-finned pilot whale		13		44				2			59
Killer whale		4		49	20				10		83
Harbor porpoise											0
Cochite											2
Dall's porpoise									330		330
White whale		15			50		4				69
Sperm whale				200					450		650
Pygmy sperm whale											0
Hubb's beaked whale											0
Cuvier's beaked whale											0
Hortlesea whale											0
Unidentified ³				200		75					275
Total ⁴	15	158		5,562	182	75	45		13,715	20	19,774

¹ Please refer to Table I of this Appendix, entitled "Common and Scientific Names of Marine Mammals Involved in Scientific Research/Public Display Permit Applications", for the appropriate scientific names.

² In some cases, permit applications or permits specify a number of animals to be taken, without specifying the numbers to be taken from a particular species or population stock. Therefore, the figures given for a particular species represent the total number of animals which might be taken if all possible alternatives were selected for that species. However, the total number given for a category of taking activity represents the maximum number of animals which might be taken, discounting any multiple takings arising from the identification of more than one species. As a result, taking category totals may be less than the sum of the individual entries for that category.

³ These figures represent permits which authorize the taking of a specified number of marine mammals, either cetaceans or pinnipeds, without identifying the individual species involved. The figures appear only in Table V of this Appendix to preclude duplication in overall taking category totals.

TABLE VI.—Number of pinnipeds authorized to be taken or imported under scientific research/public display permits

Common name ¹	Authorized (as of Mar. 31, 1975)					Authorized (Apr. 1, 1975 through Mar. 31, 1976)					Cumulative total authorized ²
	Taken by killing	Taken and kept alive	Killed in captivity	Taken and released	Found dead	Taken by killing	Taken and kept alive	Killed in captivity	Taken and released	Found dead	
South American sea lion		5					4				9
California sea lion	600	276	12	1,030	240		32		5		2,201
Northern (stellar) sea lion	180		(10)	3,000		200			7,000		10,380
Antarctic fur seal	8			100							108
South African fur seal											0
Northern fur seal											0
Pacific harbor seal	510	134	12(30)	580		336	21				1,569
Ice-breeding harbor seal	70	6	(30)	300							376
Atlantic harbor seal											0
Western North Atlantic harbor seal		18		25			7		120	20	190
Ringed seal	1,120	4	(30)		25						1,149
Gray seal		22									22
Ribbon seal	40		(10)								40
Bearded seal	790		(10)		10						800
Hawaiian Monk seal									51		51
Crabeater seal	30			400							430
Ross seal	9			200					6		215
Leopard seal	26	2		300							328
Weddell seal	50			3,596				37	39		3,722
Southern elephant seal	8			100							108
Northern elephant seal		125		4,036	275		6		5,010		9,451
Total ⁴	3,371	812	12(30)	13,467	550	536	70	37	12,231	20	30,631

¹ Please refer to Table I of this Appendix, entitled "Common and Scientific Names of Marine Mammals Involved in Scientific Research/Public Display Permit Applications", for the appropriate scientific names.

² In some cases, permit applications or permits specify a number of animals to be taken, without specifying the numbers to be taken from a particular species or population stock. Therefore, the figures given for a particular species represent the total number of animals which might be taken if all possible alternatives were selected for that species. However, the total number given for a category of taking activity represents the maximum number of animals which might be taken, discounting any multiple takings arising from the identification of more than one species. As a result, taking category totals may be less than the sum of the individual entries for that category.

³ In some cases, permit applications or permits specify alternate means of taking, which fall into more than one taking category. The taking category, species and cumulative totals, in such cases, are entered under one alternate category, and are indicated, in parentheses, under the other alternate. The parenthetical entries are not included in the totals.

NOTICES

APPENDICES B THROUGH G

The texts of Appendices B through G have been published previously. For FEDERAL REGISTER references see the introduction to this Part III Appendices.

APPENDIX H.—Marine mammal conservation—status of authorization plus funding—fiscal years 1976 and 1977

Authorizing legislation	Fiscal year 1976 totals		Fiscal year 1977 base		Fiscal year 1977 increase requested		Fiscal year 1977 totals		Authorization	
	Positions	Funding	Positions	Funding	Positions	Funding	Positions	Funding	Funding level	Expiration date
Marine Mammal Protection Act of 1972 (MMPA) (Public Law 92-522, Oct. 21, 1972):										
Sec. 110—Research grants.....	0	\$1,100,000	0	\$1,100,000	0	\$567,000	0	\$1,667,000	\$1,667,000	June 30, 1977
Sec. 114—Administration, enforcement and research.....	62	1,697,000	56	1,403,000	4	463,000	60	1,866,000	2,000,000	Do.
MMPA—subtotal.....	62	2,797,000	56	2,503,000	4	1,030,000	60	3,533,000	3,667,000	Do.
Endangered Species Act.....	0	0	6	294,000	0	0	6	294,000		
Fur Seal Act of 1966.....	14	595,000	14	595,000	0	0	14	595,000	(2)	(2)
Other authorizations—sub-totals.....	14	595,000	20	889,000	0	0	20	889,000		
Marine mammal conservation total.....	76	3,392,000	76	3,392,000	4	1,030,000	80	4,422,000		

¹ FY-1977 Base under Section 114 will be reduced by a line item adjustment of 6 positions and \$294,000 which will be funded under Endangered Species Authorization. This funding represents research on large whales (\$144,000) and enforcement of these species (6 positions/\$150,000) and is being done in accordance with the status of these animals and the regulations under which they are being protected.

² Open.